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THE little local excitement that was stirred up by the legislative discussions over the bill to provide a new State-house for Massachusetts has blown over, and like a bad dream has vanished with the long-delayed departure of the law-makers to their several homes. It appears that, though the measure was seriously discussed in both houses and passed through most of the stages preliminary to a final enactment, it was defeated on the last day but one of the session by a satisfactory majority, as soon as it was made to appear that most of the members had voted for the measure under the mistaken belief that they were simply voting in favor of appropriating some eighteen thousand dollars for certain needed alterations and repairs of the old structure, against which public opinion would never think of raising its voice. Although the blunder raises certain suspicions as to the intelligence of the members of the General Court, who have just taken to their homes the much desired title of "Honorable" and an extra hundred dollars of salary, it is consolatory to find out that some members had sense enough to discover the misapprehension even at the eleventh hour.

SO far as we can judge, the competition for the Kansas City Exchange building has ended in a manner that justifies the unusual care which was taken by the committee and their expert adviser to secure a perfectly fair contest. We confess to having entertained a fear lest this, one of the first competitions that has been planned in accordance with the latest sentiment of the profession on the subject, might not receive at the hands of the leaders of the profession the respectful consideration it deserved, and the building committee, which from the first has exhibited a clearness of perception and a liberal-minded receptiveness very uncommon, find that it had spent its money for designs which were of no real service to it. Fifty-three designs were submitted, only two of which had to be thrown out for non-compliance with the stated conditions. Of the five designs finally selected by the professional adviser, Professor Ware, and by him submitted to the building-committee, the one designed by Messrs. Burnham & Root, of Chicago, was selected by them as best meeting their requirements. The other successful authors were then placed in the following order of merit: Messrs. Edbrooke & Burnham, of Chicago; Watson & Tuckerman, of New York; J. L. Faxon, of Boston; and W. W. Clay, of Chicago. It is curious to observe that the building-committee, having remembered, perhaps, that "good wine needs no bush," and so decided that it was not necessary that the designs of the special paid competitors should be distinguished by a private mark from the designs of the unpaid, is rewarded by discovering that though unaided by any brand or ear-mark it has selected for execution the design of one of these special competitors.

THE majesty of the law seems at length likely to receive a tardy recognition in the several cities which a few years ago passed ordinances that all electric-wires must be placed underground before certain dates, fixed at fairly remote periods. It has been a matter of curious interest to the lay mind to observe how easy it seemed to be for large monied corporations to fly in the face of both public opinion and municipal law, and the success of their negative efforts must amongst other things have greatly augmented the general respect entertained for an injunction. To us this seems the most powerful legal fiction yet invented, and there really seems to be few things that a really able-bodied injunction cannot accomplish — or prevent. If our memory serves us, Chicago was the first city that took really active steps to abate the overhead-wire nuisance, and, in 1881, passed an ordinance that all wires should be below the surface on or before May 1, 1883. Until this day arrived the telegraph companies did little but protest against the law and declare that the impossible was required of them: when the fated day did come they simply took out an injunction which forbade the city to interfere with their poles and wires. Fortunately the city electrician, Mr. Barrett, was a capable and wide-awake official who fought the telegraph and telephone companies — since he had no appropriation to pay for a legal contest in the courts — by preventing them from renewing their poles and wires, arresting their men, and subjecting them to persistent persecution and pressure. At the same time the city succeeded in forcing new companies who desired to secure franchises to run their wires underground. The practical success which attended the working of the new companies' underground systems, taken in connection with that of a short portion of the fire-alarm circuit, which for a length of a third of a mile has worked in iron-pipes underground since 1876, encouraged Mr. Barrett in his efforts, and helped to convince the older companies that it was unwise to struggle longer. So, little by little, one company and another has been putting its new wires underground, and bringing the main lines into cables preparatory to taking the same step. The actual condition shows that a real progress has been made, for it appears that the City has one-and-three-quarters miles of conduit enclosing sixty miles of wire, the Sectional Conduit Company eight miles of conduit enclosing one hundred and fifty miles of wire, the Western Union ten miles of conduit enclosing four hundred miles of wire, the Chicago Telephone Company three miles of conduit enclosing seven hundred miles of wire, the Postal and the Bankers' & Merchants' nineteen-and-a-half miles of conduit enclosing five hundred miles of wire, and the Baltimore & Ohio Company half-a-mile of conduit enclosing fifty miles of wire. There are, then, over eighteen hundred miles of wire underground in Chicago, and other cities can turn to her to learn how much retardation and loss of electricity is occasioned by the wires being placed below the surface, and also which of the several kinds of conduits in use is most practically successful.

NEW YORK'S experience has been in some ways similar, though there politics have, to a certain extent, joined hands with the electric companies to resist the law. Still, if it had not been for the ingenious way in which the general fear of cholera was invoked two years ago, to prevent the wholesale opening of the streets, which the enforcement of the law would have occasioned, we believe that the wires would have been put underground at the appointed time. An Electric-Subway Commission, composed of persons of questionable fitness for the task, has been more or less employed for many months in considering the merits of the many systems of underground conduits submitted to them by inventors, and listening to the suggestions and advice of the experts of the electric companies and of those employed as their own advisers. A more efficient head (who will probably receive more than his proper share of praise) having at length been appointed, this Commission has at last brought its labors to such a point that it ventures to make a report and formulate certain recommendations and resolutions. Premising that the great expense of building what may be called practicable and permanent subways — that is, tunnels in which men may work at ease — prevents the accomplishment of the ideal solution of the problem,

the Commission states that it has turned its attention to considering which of the more temporary methods was likely to be electrically successful and pecuniarily possible. It has at length determined in favor of the adoption of a conduit of bituminous concrete, which shall possess certain fixed qualities of composition, density, elasticity, impermeability, resistance to heat and cold, and so on. As for the manner in which these conduits shall be used, the Commission declares in favor of what it styles the "drawing-in" systems; that is, frequent manholes are to be established on the line of the conduit, which will allow wires and cables to be introduced into the compartments of the conduit and drawn through to the next man-hole. It seems to us that these conclusions might have been reached long ago, and that a large portion of the wires should already be underground. One step taken by the Commission seems strange, even if not reprehensible, considering what opportunities for jobbery it seems to offer. Finding that it had no money at command to begin the practical execution of its own recommendations, and acting under the advice of the Attorney-General of the State, the Commission has resolved to call into being a construction company, with which it may contract to make, lay and operate subways in conformity with the requirements now made public. New York, therefore bids fair to follow in the path already successfully travelled by Chicago, Washington, Philadelphia, Boston and Detroit, which all have more or less considerable lengths of underground wire in operation. It will be long before the companies, particularly the telephone companies, find the new method as convenient as the old; but as they are already discovering that municipal and State authorities, backed by the courts of law, are disposed to curtail their privileges wherever possible, they seem at length to perceive that there is worldly wisdom in keeping themselves and their operations as much out of sight as possible, if only for the sake of avoiding more severe harrying.

HERE in the East, the owner of a lot of land, who also supposed himself to possess the title to the building or buildings that might be upon it, would consider it extremely absurd were he to wake up some fine morning and find that the building or buildings had been transferred to some other lot, or were on their way to another location. In San Francisco, as we learn from the *Call*, this condition of things is so common as to excite very little attention and even less surprise. In fact, there is an activity in San Francisco real estate that is quite apart from the ordinary "activity," and that causes a phenomenal amount of building movings — more than double those in any other city of the same size, so it is said. Real estate titles are very apt to prove defective in San Francisco, and many men have built houses on lots that turned out to belong to some one else. In a case of this kind, as the real owner of the land could of course lay claim to the building, the only resource for the builder was to sneak the house away, unobserved by the land-owner, if possible, lest he secure an injunction and stop the transit. As injunction papers may not be served on Sunday, a favorite time for beginning this "house-stealing" has been midnight on Saturday, and it is told that not long ago six houses were taken into the street on one Sunday.

IT is a little difficult to determine from the newspaper reports, in which a girder, rafter and joist are spoken of as if synonymous or identical terms, just what caused the collapse of a portion of the Second Street Court-House, in Kansas City, on June 27, and it really does not much matter. So far as we can determine, the building in its best days was a good specimen of jerry construction; it had long been practically condemned by public opinion, and it had been partially wrecked by the wind storm of May 11, in a way which justified those who held it in evil repute; and it was while the damage inflicted at that time was being repaired that a partial collapse of the structure took place, which fortunately did no damage to the wretched prisoners confined in the jail attached to the building. It seems as if a commutation of sentence ought to be accorded to these unfortunate outcasts in compensation for their having been subjected to an unauthorized punishment,— an hour of peril and terror, as truly inflicted upon them by the judges as by an incompetent builder or architect. The point worthy of note is that competent expert advice is to some minds so unpalatable that it cannot be digested if it runs counter to the opinions or desires of those who seek it. The county judges, at first doubting their own architectural attainments, appointed a committee of three, among them the president of the local society of architects and the late superintendent of Buildings, to report on the advisability of repairing the damage caused by the wind. This committee advised that it was unwise to repair the structure, and seemingly recommended that it should be pulled down. The county judges then accomplished a notable feat: they acquired an instantaneous and competent knowledge of architecture, told the experts that their conclusions were erroneous, and discharged them, refusing, it is said, to pay for their services. The judges having thus at once asserted their own opinion, proclaimed themselves past-masters of building construction, and given a hint as to how they would treat those who did not reach the same conclusion as themselves, appointed a second commission to examine the structure, and on receiving its report that it would be well to repair the court-house, graciously accepted it, paid the members twenty-five dollars, and appointed one of them to be architect in charge. Shortly after, a portion of the building fell down. If lives had been lost, we presume this exceedingly able court would have conducted the inquest, called itself as expert witnesses, bullied all who wished to give testimony against it, interpreted statutes as it pleased, and acquitted itself of all blame in the matter.

LIVING on the skirts of a wood of no inconsiderable size, we have some personal knowledge of the difficulties that attend the preservation of forests. It is no unusual thing for us in springtime or autumn to have to drop the pen and go out and help such neighbors as think it worth while to "fight fire" — usually incipient ones. As for preventing the stealing of wood, the girdling of trees, and the wanton destruction that the tramp or native "hoodlum" delights in, it is absolutely impossible, unless stringent forestry laws can be enforced by a large and properly-organized body of foresters, such as are employed in European countries; for instance, Saxony, which has about as many acres of woodland as the State of New York, has a body of six hundred foresters to protect it. New York, on the other hand, which last autumn appointed a Forestry Commission, only authorizes the employment by it of sixteen foresters, who would be of as much practical use as so many children in preventing the destruction of the State's forests, which are scattered through two hundred and thirty-two townships lying in fourteen different counties. All that a force of this size could possibly do would be to discover and possibly prevent the unauthorized destruction of woodlands by railroads, such as has been effected by the Northern Adirondack Railroad Company, or such impudent assaults of timber thieves as were made on the United States timber lands in Florida and Louisiana. The New York Commissioners have found an ingenious way out of the difficulty which the letter of the law imposed on them and have appointed a "fire warden" in each of the two hundred and thirty-two townships, so that there are now employed in guarding the forests about half the number of men that older countries have found necessary. Besides this, the Commissioners have printed and posted in hotels and other public places four rules, which not only are of rather the goody-goody order, but, as there are no penalties for their infraction, are likely to have small effect on the lawless. One of them is, however, sensible and fairly practical: it provides that any one who wishes "to clear land by fire or turn a fallow" shall give the nearest fire warden five days notice, and his adjoining neighbors forty-eight hours warning of his intention, and must have competent persons on guard during the burning; and no such fire shall be allowed save when the trees are in full foliage. We find in the fire-tables of the *Chronicle* that there were reported forty-six forest and prairie fires in the United States during 1885, which consumed $1,776,375 worth of standing timber, from which it appears that a single careless hunter or tramp may cause an average loss of some $38,000 worth of standing timber, which in the form of dressed lumber would house a small town; and it appears a reasonable corollary to assume that if any of the new fire-wardens checks or prevents a single fire in heavy woodland his sole act will have saved to the State three thousand dollars more than the total appropriation the commissioners now have at their command. Another important step taken by the new officials is the preparation of complete maps, on a large scale, of all the State lands, copies of which are to be furnished to the new foresters and fire-wardens.

ANCIENT AND MODERN LIGHT-HOUSES.—I.

Latin Light-house, after a Medal in the collection of the Marshal d' Estres.

THOUGH there is incontestable evidence that light-houses did exist in ancient times, the old authors make but meagre reference to them, and of the towers themselves but scanty ruins remain; this is but natural, as they must of necessity have been situated in places not only exposed to wind and storm, but also frequently have formed portion of fortified places, and so subject to all the risks of war. Besides, a tower from its very shape is the least stable of architectural structures, and succumbs to accidents which other buildings successfully resist.

When Hercules put on the shirt of Nessus, he in his agony tore the flesh from his body, and finally unable longer to endure the torture, built and lighted a funeral pyre and threw himself upon it; when the flames commenced to lick his body a cloud descended from the sky, and carried him to Olympus. This legend may perhaps be the reason why the Greeks attribute the first light-houses to him. At Thasos, Smyrna and in Italy he was σωτηρ (Saviour), *i. e.*, protector of voyagers, and tithes were vowed to him to be spent in entertainment.

The oldest light-houses known were the towers built by the Sybians and by the Cuschites, who dwelt in lower Egypt; in addition to being light-houses they were temples named after some deity; they were held in great veneration by sailors, who enriched them with their offerings; it is supposed that they contained charts showing the coasts and the navigation of the Nile. At first these charts were engraved on the walls; later they were made on papyrus. The priests, who were the light-keepers, taught the pilotage of vessels, hydrography, and how to steer by the use of constellations.

The manner of lighting these towers was very primitive: the fuel was placed in a kind of iron or bronze basket composed of three or four dolphins or other marine animal interlaced together; then the basket was attached to a long pole projecting from the tower towards the sea.

The Baron de Zach says, "that the Sybians called these towers *tar* or *tor*, which signifies height; *Is* means fire, hence Tor Is tower of fire; from this comes the Greek τυρρις and the Latin *turris;* when these signals were situated outside of the villages on rounded eminences they were called *Tith*. Tithon, so celebrated for his longevity, seems to have only been one of these structures dedicated to the sun, and Thetis, former goddess of the ocean, only a light-house near the sea, called *Thit-Is*, fire on an eminence. And the legend of the massacre of the Cyclops killed by the arrows of Apollo is simply the mythological way of expressing the manner in which the signals of the Cyclopian towers on the coasts of Sicily were extinguished by the rays of the rising run." The above, if not true, has certainly the merit of ingenuity.

Lesches, a minor poet, born about 600 B. C., mentions a light-house placed on the promontory of Sigæum in the Troad, near which there was a roadstead. This is the first light-house which appears to have been operated regularly, but though it heads the list, it has not had the glory of giving its name to those succeeding it; this honor was reserved to the tower built on the Isle of Pharos, at Alexandria, which has also served as a model for the most celebrated towers since erected. According to Suetonius, the tower at Ostia, built by Claudius, was copied from the one at Alexandria, and appears to have been the most remarkable of the Latin towers. Italy, however, possessed many fine ones, such as those of Ravenna and Pozzuoli mentioned by Pliny, and the one at Messina, which gave its name to the strait which separates Sicily from Italy, and where the famous rocks of Scylla and Charybdis are found; and finally the light-house on the Island of Capri, which was overthrown by an earthquake a few days before the death of Tiberius.

Latin Light-house, after a Medal found at Apamea.

The shape of these Latin towers is somewhat doubtful. Herodianus says that the catafalques of the emperors resembled light-houses; now the catafalques were square, while the light-houses were not always so. A medal in the collection of the Marshal d'Estres shows a light-house of four stories, circular in plan; another medal found at Apamea, in Bithynia, an ancient country of Asia Minor, also shows the circular form, and finally, the light-house at Boulogne was octagonal.

THE LIGHT-HOUSE OF ALEXANDRIA.[1]

There are several noted ancient light-houses, of whose history and appearance we have more or less authentic accounts. Prominent among all is the famous one at Alexandria, on the Island of Pharos, which was regarded as one of the wonders of the world. Opinions differ as to whom to ascribe the honor of building this magnificent structure; by some it has been assigned to Alexander the Great, by others to Cleopatra; but the best evidence is that it was erected by Ptolemy II, Philadelphus, who reigned 283-247 B. C. It is quite certain that Sostratos was the name of the architect. The following rather tricky story is told of him: like many another architect he desired to perpetuate his fame by inscribing his name on the work, a perfectly laudable ambition; to accomplish this he engraved deeply on one of the stones, "Sostratos of Gnidos, son of Dixiphanus, to the Gods protecting those upon the sea." Knowing very well that Ptolemy would not be satisfied with this inscription, he covered it with a thin slab of stone, or coating of cement, which could not long resist the action of the weather, and on this he inscribed Ptolemy's name: as he anticipated, the covering disappeared in some years, and with it the name of the king, thus keeping all the credit to himself. Pliny says that Ptolemy purposely left off his own name so that Sostratos could have all the glory, but this is so directly contrary to the way in which princes ordinarily act, both in ancient and modern history, that such an excess of modesty is hardly probable.

Another disputed point is whether the tower gave the name to the island or the island to the tower; the latter is the more likely; at all events this light-house has given *its* name to its successors, and has become the generic name.

Light-house in Latin is *pharus;* in Spanish and Italian, *faros;* in French, *phare;* and even in English *pharo* was once used, though now obsolete.

The tower was square in plan, of great height, and built in offsets. Edrisi, an Arabian geographer of the thirteenth century, said that in his time it was six hundred feet high, and that the light could be seen one hundred miles; no true American will believe this, for have we not the Washington Monument, five hundred and fifty feet high, the "tallest artificial structure ever erected on the surface of the earth?" it is more consoling to our vanity to consider that the old Arabian was romancing.

At the top of the tower was the brazier to contain the fuel; it was truly a "pillar of fire by night, of smoke by day," and must have been a welcome sight to the storm-tossed mariner, though the labor of carrying the fuel to the top of that tall tower must have been a wearisome task to the poor light-keepers.

The tower, from all descriptions left us, seems to have been built in a manner similar to the Tower of Babel, which had eight stories, or as Herodotus calls them, towers placed one upon the other. Pliny affirms that its cost amounted to eight hundred talents, or about $946,000.

But to go back to our Egyptian who evidently was an ardent admirer of this structure: "This light-house," says he, "has not its equal in the world for excellence of construction and for strength, for not only is it constructed of a fine quality of stone, called 'kedan,' but the various blocks are so strongly cemented together with melted lead, that the whole is imperishable, although the waves of the sea continually break against its northern face; a staircase of the ordinary width, constructed in the interior, extends as high as the middle of the structure, where there is a gallery; under the staircase are the keeper's apartments; above the gallery the tower becomes smaller and smaller until it can be embraced by the arms of a man. From this same gallery there is a staircase much narrower than the tower, reaching to the summit; it is pierced with many windows to give light within and to show those who ascend where to place their feet. At a distance the light appeared so much like a star near the horizon, that sailors were frequently deceived by it. Arabs and travellers have told wonderful stories about this tower; some say that Sostratos supported this immense mass on four great stone crabs, and even more remarkable, that Alexander the Great placed on the top of the tower a mirror constructed with so much art that by means of it he could see the fleets of his enemies at one hundred leagues distance, and to enter still more into particulars, that a Greek named Sodorus, after the death of Alexander, broke the mirror, while the garrison of the tower was asleep."

DOVER TOWER.

There are two towers, one at Dover, the other at Boulogne, which for many years lighted the British Channel. But little is known of the history of the former; some believe it to be the same tower that now stands in the middle of Dover Castle; others think that a grand mound of masonry, stones and chalk, near Dover, called the "Devil's Drop," are the ruins of the ancient tower. It was built by the Romans, and was probably octagonal in plan, and resembled in other particulars its mate at Boulogne.

Its antiquity no doubt exceeds that of any light-house in Great Britain. It has not been used as such since the Conquest, but before then burned for many centuries those great fires of coal and wood formerly maintained on several towers still standing on those coasts.

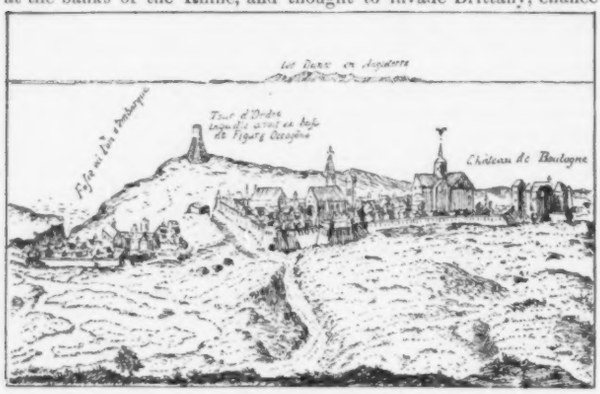
LA TOUR D'ORDRE.

Of the tower at Boulogne we have more accurate information. It

[1] During the illness of the editor the illustrations of the light-house at Alexandria, intended to accompany this article, were published by mistake. See our issue for May 15, 1886.

is well known under the name of the *Tour d'Ordre* or *d'Orde*. Two centuries ago its ruins might still be seen.

The story goes that when the too famous emperor Caligula arrived at the banks of the Rhine, and thought to invade Brittany, chance



Tour d'Ordre, Bologne, after a drawing by Claude Chatillon.

obtained for him the voluntary surrender of a young Breton prince. To celebrate this piece of unforeseen good luck, he caused to be erected on the cliffs of Gioriacum, now Boulogne, a triumphal monument to perpetuate his renown. The exact date at which this monument was changed to the more useful purpose of a light-house is unknown; but it is certain that a light shone from its summit in 191 A. D., as there is a bronze medal upon which Commodus bears the title of Brittanicus, in remembrance of the victory of one of his lieutenants over the Brittons, and which represents this light-house and the departure of a Roman fleet.

Located at the most convenient place for crossing the British Channel, the tower of Boulogne was kept in careful repair during the occupancy of Gaul by the Romans. It not only served as a light-house, but also as a fortress, and, owing to its position and massive construction, it was well suited for this purpose. In the sixteenth century, during the short and disastrous occupation of Boulogne by the English, the Tour d'Ordre, as it was then called, was surrounded by two ramparts, one of brick and the other of earth, and was armed with pieces of artillery. It was admirably located, either for the defense or the attack of Boulogne, for it commanded the city and both banks of the river.

However, it was not the hazard of war which made this tower lower its haughty front and caused its ruin. All that it suffered was the damage to its lantern, several times repaired. Its final destruction was entirely due to the carelessness of the mayor and aldermen, who took no pains to check the action of the sea at its base, and of subterranean springs which gradually sapped its foundation, so that finally, between 1640 and 1645, tower, fort, and even the cliff itself fell. The Boulognese were rather glad of it, for they had to pay taxes on the land, in virtue of an ancient right to a certain Lord de Baincthun. They argued that as the land had disappeared they were freed from further obligation to the proprietor. However, Parliament did not take that view of it, but informed Messieurs the Boulognese that as they were responsible for the loss of the tower, they could continue paying a tax of two thousand herrings, delivered at Amiens, Arras, or at other cities at equal distances that the proprietor might designate; or they could replace the tower in its former condition, and relinquish to the Lord of Baincthun, Baron of Ordre, the right of taxing all fishermen entering Havre. They concluded to pay the tax, and continued to do so until the French Revolution.

The accompanying design, after Claude Châtillon, engineer of King Henry IV, is apparently trustworthy. Descriptions of the tower are rather meagre; they give, however, some useful information concerning the situation, dimensions and form of the edifice, and also of the materials employed in its construction. The latter were yellow and gray stone and red bricks. The tower was situated the length of a cross-bow shot from the edge of the cliff; it was octagonal in plan, and one hundred and ninety-two feet in circumference. Like most Roman light-houses, each of its twelve stories was three feet less in diameter than the one immediately beneath it, thus giving the tower a pyramidal shape. It is stated that its height equalled its circumference, or, in round numbers, two hundred feet, which seems to be an unnecessary height for a tower situated on a cliff one hundred feet above the sea level. Each story had an opening in the middle like a door, and there could still be seen, in the beginning of the seventeenth century, three vaulted rooms, one above the other, connected by a stairway, and doubtless intended as dwellings for the keepers. The place where the fire was lighted is conjectural, as the chroniclers of the ninth century state that the summit was repaired so that fires might be lighted on it. It is reasonable to believe that before this repair the fire shone in a room in the upper story.

This ancient light-house is now replaced by modern lights, one a fixed red, visible for four miles, and two fixed white lights, visible at a distance of nine miles, erected by the French Light-House Board in 1835.

THE COLOSSUS OF RHODES.

The Colossus of Rhodes may or may not have been a light-house. The weight of testimony bears toward the latter supposition, and it is also more than doubtful if it stood at the entrance of the port, and that the largest vessels could pass between its legs.

There is no doubt, however, that this colossal statue of Apollo was completed 285 B. C., that it took fifteen years to build, and that, after standing fifty-six years, it was overthrown by an earthquake. The Rhodians received large sums of money from the kings and people of Greece to re-establish the statue and to rebuild their ruined town, but as they probably found it more to their advantage to apply the funds to other than statuary purposes, a convenient oracle informed them that its re-erection would be followed by dire misfortunes, so of course they could not go against the will of the gods.

Two Restorations of the Colossus of Rhodes.

Chares of Lindus, a pupil of Lysippus was the designer. It is said that he killed himself in despair, because, after he had spent all the money appropriated, the statue was but half finished, and that it was completed by another Lydian named Lachus. Such stories are rather doubtful.

The statue was about one hundred and eight feet high, and was made of bronze. After it was overthrown "it was still a marvel," says Pliny. "Few men could put their arms around the thumb; its fingers are larger than many statues. Its disjointed limbs seem vast caverns in which one sees enormous stones by means of which it was weighted. It is said that it cost 500 talents ($590,000), the sum which the Rhodians had taken from the equipages of war abandoned before their city by Demetrius when he raised the siege, fatigued by its length."

The ruins of the Colossus remained for nine hundred years, but in 672 A. D., Mauviah, one of Othman's lieutenants, had it broken to pieces, and sold it to a Jew, who carried it off on a thousand camels, if we can believe the Byzantine chroniclers.

The cuts show what it may have been. The treatment with the rays about the head and the flaming brazier in the hand bears some resemblance to our statue of Liberty enlightening the World.

Cost of our Wars — Register Rosecrans has written a letter to Congressman Warner in reply to a question from that gentleman, asking the expense to the government of our three principal wars. General Rosecrans replies that the sum assumed and paid by the government for the War of the Revolution was $6,000,000; the War of 1812 cost $115,000,000; the Mexican War, $135,000,000 and the War of the Rebellion $6,189,920,905.

AN EDITOR'S TRIP ABROAD.[1] — III.

ROWSLEY.— HADDON HALL.— THE LONDON EMBANKMENTS.

PARIS, June 19, 1886.

Stone Lion at Oum-el Awamid. From Renan.

ONE day in Liverpool is as much as most American travellers wish to allow themselves, and we had our trunks carried over the next morning by the hotel porter to the central station close by, and consigned to the guard for transmission to the "Left Luggage" room at St. Pancras station in London, reserving, to carry in our hands, baggage enough to enable us to stop over comfortably a night at Rowsley.

Rowsley, which is to the Midland Railway very much what Chester is to the Northwestern, lies at the confluence of the Wye and Derwent rivers, in the heart of the hill-country of Derbyshire, and derives its main interest from being the nearest station both to Chatsworth, which lies six miles north of the railway, and Haddon Hall, which is two miles south. Independent of these advantages, however, the village of Rowsley is brimful of that delicious charm which is to be found nowhere except in an English hamlet. The country lies on a limestone formation, and the houses, fences, barns, and even the shelters for the cattle in the pastures are built, in consequence, of stone, used with picturesque freedom and ingenuity. So far as I could see, there was hardly a brick in the place, even the chimneys being all of stone. The limestone is of excellent quality, hard and white, and if the chimney-tops are occasionally rebuilt as they burn out, the houses seem disposed to last for ages. The Peacock Inn, the only hotel in Rowsley village, although there are others in hamlets near by, was, as an inscription over the door relates, built by

IOHN STE
VENSON, 1652

but except that the stone floor of the entrance hall is a good deal worn, it seems in as good condition as ever. Very few changes have been made in the structure during the two hundred and thirty-four years which have elapsed since it was built. Most of the windows have mullions and transoms of stone, which show inside the room just as they do outside, and the frames, apparently of rough wrought-iron, for the leaded sashes seem to fit into grooves in the stonework, and to have been built into it, although so much mortar and white-wash was daubed over them that I could not tell to a certainty about this point. All the sashes above the transoms I found to be fixed in place, as were also those below the transoms, except one or two in each window, which had an inner iron sash hung to the frame, and arranged to swing out, with an elbow-jointed rod to keep them under control, and a sort of latch fastening. The leads were, I should say, something more than three-eighths of an inch wide, giving the windows a substantial appearance quite different from the quarry glazing which we see in most of our church-work; the whole affair was extremely picturesque, and would have been in every way admirable, except that we did not dare to leave the window open through the night for fear that rain might come in. In other respects the interior of the house was very similar to that of one of our colonial houses. The front door was made of boards, with vertical battens, riveted or bolted through, about one in every three inches, but the other doors were panelled and moulded just like ours, with panel-mouldings apparently planted on, just as ours would be. The hostelry itself derives a certain interest from the connection which it appears to have with Haddon Hall, much of which is very little older, although it seems like a ruin in comparison with the inn. According to the legend of the Hall, Dorothy Vernon, the heiress of the family which had owned Haddon ever since the Conqueror gave the land to her Norman ancestor, eloped while a ball was going on in the great gallery, which we all know so well from the pictures, with Sir John Manners, who waited for her outside a door which still opens from the ante-chamber of the ball-room into the garden. Sixteen years after the elopement the accession of the Manners family to the estate was signalized by the erection of the Peacock Inn in the nearest village, displaying the crest of the new owners, whose heirs, the Dukes of Rutland, hold the Haddon Estate to this day. The proprietors of the Peacock Inn seem to take a modest pride in its antiquity, and keep up something of the old ways. Even in June a fire was blazing in the wide fireplace of the dining-room, and our bill, which seemed to be printed from a form composed during the Elizabethan period, provided a blank space for the charge of "rush lights," if we had happened to want any.

The general appearance of Haddon Hall, with its balustraded terrace and the row of deep bay-windows in the long gallery, is very familiar to most of us. Inside, the most curious of the less-known portions are, perhaps, the chapel, which still contains a great deal of Norman work, very well preserved, and must be the oldest part of the building, and the kitchen, which can hardly be much later, although it still retains its fireplaces and furniture. More interesting, however, in some respects even than the Hall, is the house which stands at the entrance to the grounds, and serves as a habitation for the custodian of the mansion. At some period this must, apparently, have been a sort of store-room, or, perhaps, guard-house, but seems to have been made over later into a separate dwelling, for there is now attached to it a most curious little garden, full of old trees cut into the fantastic shapes which were fashionable two hundred and fifty years ago, but still bright with flowers, and as nicely kept as when Dorothy Vernon and her husband overlooked it from their front door. Ancient as the garden seems, the house to which it belongs seems far more ancient still. The plan is simple. A recessed porch, with an elliptical arch to carry the wall over it, opens on each side into a room, now as prettily furnished as other English cottage rooms, but covered with a flooring laid on huge beams, which project through the wall, while sloping buttresses, of considerable projection, stiffen the wall between the windows. The upper story, or, rather, half-story, as it is little more than a garret, seems to have been intended from the beginning for a dove-house, the whole gable wall, above the level of the tie-beams, being laid alternately with oak beams, and roughly-squared stones, set a few inches apart, so as to allow the pigeons to fly in and out. Viollet-le-Duc tells us that the possession of a "*colombier*" was in France in old times a mark of nobility, and the Vernons perhaps provided in this simple way for a flock of doves in emulation of some of their Normon relatives across the Channel. If so, their successors have to thank them for an idea which completes the picturesqueness of one of the most charming bits of domestic architecture in England.

We left the peaceful lanes of Rowsley with sincere regret, and were soon hurried out of the Derbyshire valleys into the smoke and grime which occupy most of the central part of England, and culminate in London. Here we were on familiar ground, and except that some of the buildings which were new and bright when I first saw them had taken on their London garb of dirt, there was not much change to note in the region about Piccadilly Circus, which Americans most haunt. We took advantage, however, of the opportunity afforded by our visit to the Tower, a comparatively small portion of which is now open to the public, to return on a river steamboat, sailing from London Bridge to the Chelsea Pier, past the whole length of the three Embankments, which are now being rapidly occupied by buildings of remarkable interest and beauty. It is hardly necessary to say that no site in London is so favorable for a building intended to be seen and admired as one of the Embankments, and the architects of the city seem to have understood this at once, and to have done their best to impress the proper character upon the work from the outset. Of course, the more important buildings, such as the new Royal Hotel, and some still larger and richer, which I did not recognize, are on the lower portion of the Embankment, below Somerset House, but the Chelsea end is adorned by rows of new dwelling-houses, nearly all of which are of great interest. Among them, as the steamer sails slowly past, one easily recognizes Norman Shaw's "Swan House," together with his unnamed house adjoining, and two or three more by the same hand, drawings of which have appeared from time to time in the English journals, while there are many others which show the familiar character of the work of other noted designers. I am sorry to say that Queen Anne architecture, as such, does not appeal very strongly to my soul, and Swan House, with its lanky windows and flat, expressionless façade, disappointed me. A good deal of Norman Shaw's work is in execution far less interesting than in his drawings, but there are many exceptions, and some of his smaller houses near by were made beautiful by a masterly use of recessed balconies and overhanging stories, which other architects, in neighboring buildings, had also employed in different, but interesting ways. The general effect of the houses on the Chelsea Embankment, as seen from the river, is, however, to my mind, a trifle artificial. The rows of high gables, and the small panes of glass, seem a little too conscious of their resemblance to old Dutch work, and one misses the frankness of expression which characterizes the country houses built by the same architects. It is curious to notice the difference in style between the architecture of Chelsea, the stronghold of æstheticism, and that which prevails in the other new quarters of South Kensington and Brompton. While the Chelsea Embankment might be set down in Holland without exciting much remark, the Cromwell and Brompton roads would answer very well for New York. It is true that the London houses are apt to have more land attached to them than those in New York, and the London whitebrick is as yet imperfectly naturalized in America, but there is a good deal of it there even now, and the Avenue St. Nicholas, or any of the wide Harlem streets, might be built up from the South Kensington patterns without materially interrupting the course of the vernacular style — except in the way of improving it.

[1] Continued from page 3, No. 549.

The Illustrations

Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

THE TERRACE IN CENTRAL PARK, NEW YORK, N. Y. DESIGNED BY THE LATE J. W. MOULD, ARCHITECT.

[Gelatine Print, issued only with the Imperial Edition.]

MOUNT ST. MICHEL, BRITTANY, FRANCE.[1]

MOUNT ST. MICHEL, SKETCHED FROM THE DIKE BY MR. WALTER COPE, ARCHITECT, PHILADELPHIA, PA.

For a description of this renowned structure see our issue for March 11, 1882.

MONUMENTS FROM THE CEMETERIES ABOUT BOSTON, MASS.

FIREPLACE IN THE CHATEAU, AZAY-LE-RIDEAU, FRANCE.

THE ARCH OF CONSTANTINE, ROME.

LIGHT AND WATER-COLORS.

Flemish Credence. Oak. South Kensington Museum.

From Cotman's "*Antiquities of Normandy.*"

WHERE has been an animated correspondence in the *Times* on the action of light on water-colors, incidentally raised by a communication of mine not intended to provoke controversy. I imagined, indeed, that the fading of water-color pictures and drawings was so obvious and notorious as to be beyond dispute, and my intention was to suggest the best means of counteracting the evil.

I was, however, greatly mistaken. I found, indeed, to my infinite surprise, that darkness reigned where the fullest enlightenment might have been looked for, and where, literally speaking, darkness was a palliative, light was indirectly recommended.

The unqualified assertion, utterly erroneous as it is, that water-color drawings not only do not fade, but that they actually deepen in tone by age, was advanced by the highest authorities and masters of the art in question. . . .

Artists' pigments, whether they are embodied as "water" or "oil" color or in any other vehicles (generally speaking the substances employed are the same), are of the most varied and diverse nature and origin—mineral, vegetable and animal. Natural metallic oxides and earths, complex chemical compounds, gums, extracts, and the inspissated sap of trees and plants, juices and secretions from insects and the higher animals, are alike pressed into the service of the painter. Modern science and commercial enterprise have in our own time vastly augmented the number and variety of these coloring substances. Unquestionably thereby the artist's palette has been greatly enriched and the physical means of art extended; but whether at the same time those means have been strengthened and improved in the sense of durability is another question.

Painters in the old times, when their pigments were comparatively few and simple in their nature, were usually in the habit of preparing, purifying, and refining their own colors. They were alive and attentive to the physical properties of the substances they employed, discarding, as far as they were able, such as were notoriously fugacious in their nature or uncertain in their action upon other colors. Now, on the other hand, artists, as a rule, simply ignore all this, accepting with blind faith whatever the color-merchant offers them; ever craving for some newer and more vivid tint, be it as fixed and eternal as the sapphire's blue or the ruby's red or as short-lived and fleeting as a dream.

The color-merchant, however, if he be unscrupulous or even only ignorant and careless, may work infinite mischief to art and artists; as it is, the artist is absolutely at his mercy. The old and salutary motto "*Caveat emptor*" scarcely applies in this case, for there are seldom any instant available means of testing or verifying the representations of the eager tradesman. Certain it is that every day some fresh pigment, guaranteed as absolutely stable and permanent, but of the properties of which the vendor himself may have had no adequate experience, is foisted on the helpless, unsuspecting painter. But this is nothing less than the most cruel and insufferable fraud, the consequences of which it seems scarcely necessary to dwell upon.

To this subject, however, the attention of eminent scientific authorities is now being directed; the field as yet has been but little tilled, and there is both honor and profit to be gleaned by the qualified and earnest laborer in it.

This matter lies, indeed, at the root of the question before us; it is for chemists and other scientists to deal with it effectually. The general subject of the preservation of the admirable works of past time in water-colors, however, is a many-sided one, and there is so great a wealth of illustration to be brought to bear upon it, that I shall probably find it impossible to entirely avoid trenching on the province of the scientist, or to steer quite clear of topics not strictly relevant to the specialty under consideration. . . .

Of course if it can be shown that some pigments, heretofore habitually made use of by water-color painters, are more or less fugacious, while others are stable and permanent, and if the two classes of colors have been made use of in the same picture, it stands to reason that any work so executed must, if freely exposed to the light of day, suffer gradual alteration and deterioration in an unequal manner. That is to say, portions of the work will retain their original force and purity of tint, while others will change in varying measure, or even vanish altogether. Obviously for any picture or drawing to be perennial — that is, unfading — if exposed to daylight, it would need to be entirely executed throughout with unalterable colors. Such a selection of tints is doubtless quite possible, but as water-color chromotography stands at present this would entail the abandonment of a great number of the most beautiful and serviceable pigments in current use. . . .

Of the pigments in present use, as might have been expected, the most stable are those of the mineral kingdom: many such colors are in fact perhaps absolutely unalterable in so far as the influence of light is concerned. On the other hand, the great majority of colors of vegetable and animal origin are more or less unstable and fleeting. I cannot indeed call to mind a single pigment in these categories which can be deemed absolutely permanent, while many of them have an existence scarcely less brief than that of the gaily-colored flowers whose tints they rival or surpass. The essentially non-permanent pigments of course are of every degree of mutability, some reasonably resistant and comparatively long-lived, others, so to speak, whose existence is to be measured by days and months rather than years or generations.

For this mutability, in whatever measure nevertheless, there is a sovereign remedy: as the active enemy is light so is the saviour darkness. It is probable even that the most evanescent pigments would be unchanged if kept entirely secluded from the light. It is needless to say, however, that drawings are not meant to be hidden under a bushel. . . .

Water-color drawings, as the President of the Royal Water-Color Institute says, do not fade. He is speaking, be it noted, of antecedent works of English painters. Now let any one take one of these drawings, something of little value (for it is a question of an experiment *in corpore vili*), framed and glazed as usual. Let one-half of the drawing be covered with several sheets of stout paper pasted outside the glass, so as to form a perfectly opaque dark envelope, the other half remaining visible, as before. Let the drawing be then hung up and exposed to the light, say for a year. To suspend it face outwards in a winter casement is the best method. At the end of the period let the paper covering of the darkened half be removed; the result will, I apprehend, be convincing to the most incredulous person. The drawing will have become a dull work, one-half (the darkened one) remaining just as it was at first, whilst the other will have faded and become a pale, disjointed muddle, the two halves being as distinctly and sharply bounded as if a wet sponge had been passed over a moiety of the surface.

More striking still is another demonstration. Both experiments, by the way, have been frequently carried out, and the most careful notes taken of the results by more than one inquirer. It is this: Let a series of even flat tints of water-colors be laid in parallel strips or bands side by side on a sheet of paper, the colors chosen being such as are currently furnished by the color-merchant, and to which varying repute as to durability attaches. Take, on the one hand, the carbon blacks, Indian ink and lamp-black; simple oxides and ochres, such as Indian red, light red, burnt sienna, and yellow ochre; mineral and chemically-prepared colors, such as ultramarine, cobalt, and aureolin; and on the other hand, carmine, crimson lake, madder brown, sepia, bistre, indigo, sap-green, gamboge, gallstone and brown pink. Cut the sheet of paper in two across the series of parallel bands, so as to have two equal sets of tints. Keep one of them in the dark in a portfolio or betwixt the leaves of a book, and frame the other half and hang it up to the light in a window casement as before. At the expiration of the same period — though much less than a year would really suffice—let the two halves be brought together, again compared as in the former illustration. Whilst in some instances the tints in the respective halves will be found to be unchanged and exactly alike, others in the exposed portion will have absolutely vanished off the paper, or at best left but a faint and dirty stain, generally due to some extraneous impurity in the pigment, more permanent in its nature than the substance which it adulterated. . . .

As regards the relative durability of fugacious pigments, the action of direct sunlight is very rapid and notable. The exposure of any water-color drawing of Turner's, for instance, for a few days even to

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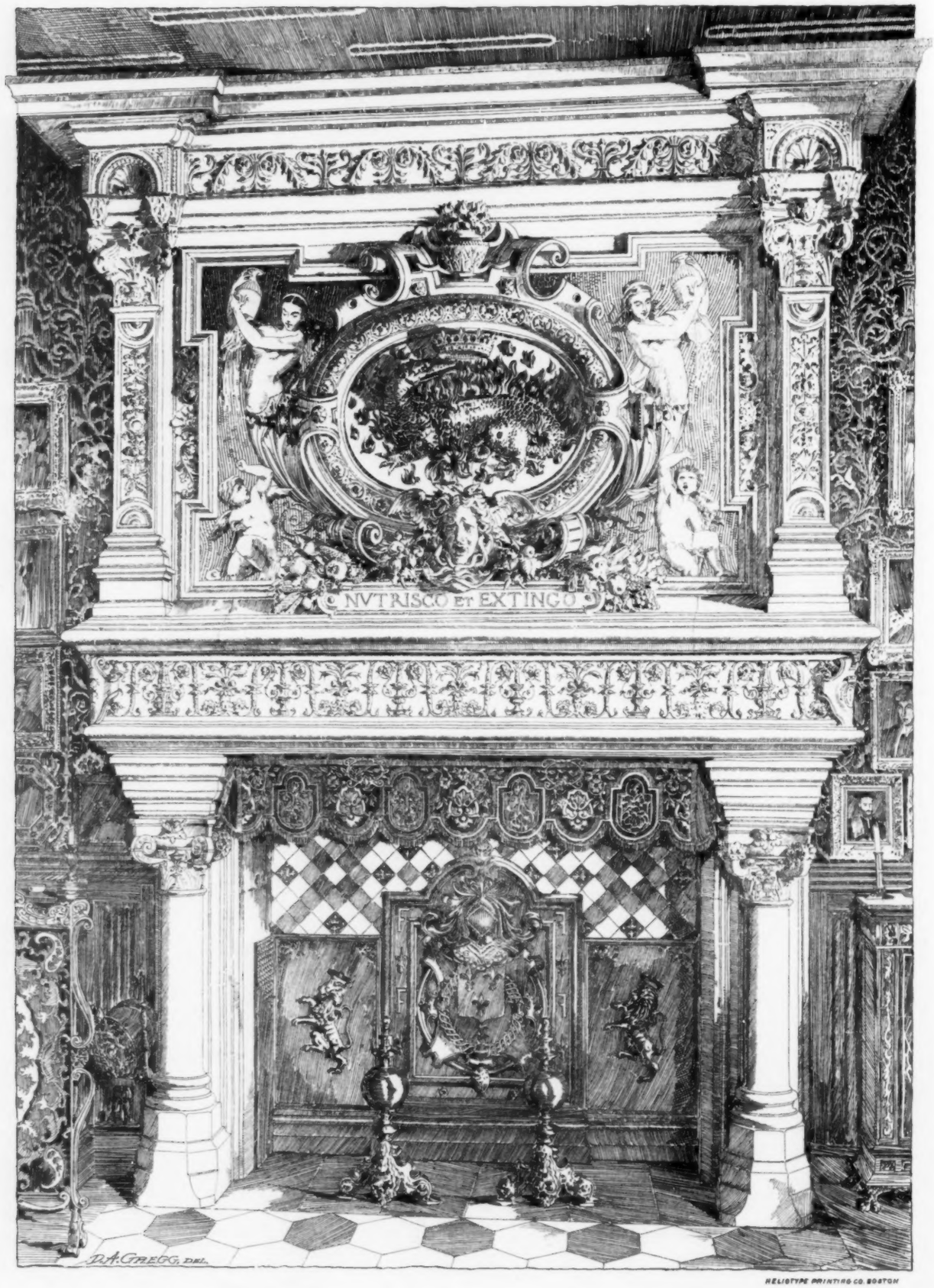

Fireplace, Azay le Rideau, France:

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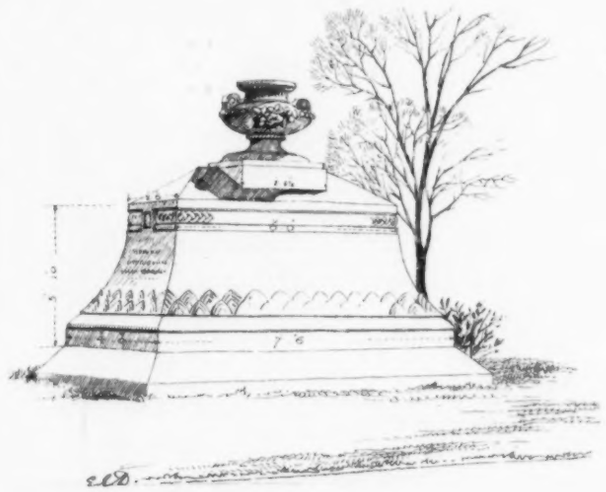
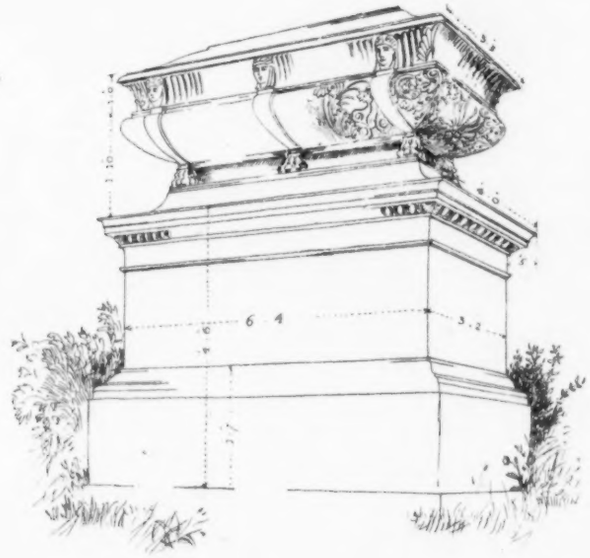
MONUMENTS

from the Cemeteries, Boston, Mass.





Sketched by E.Eldon Deane.

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Arch of Constan

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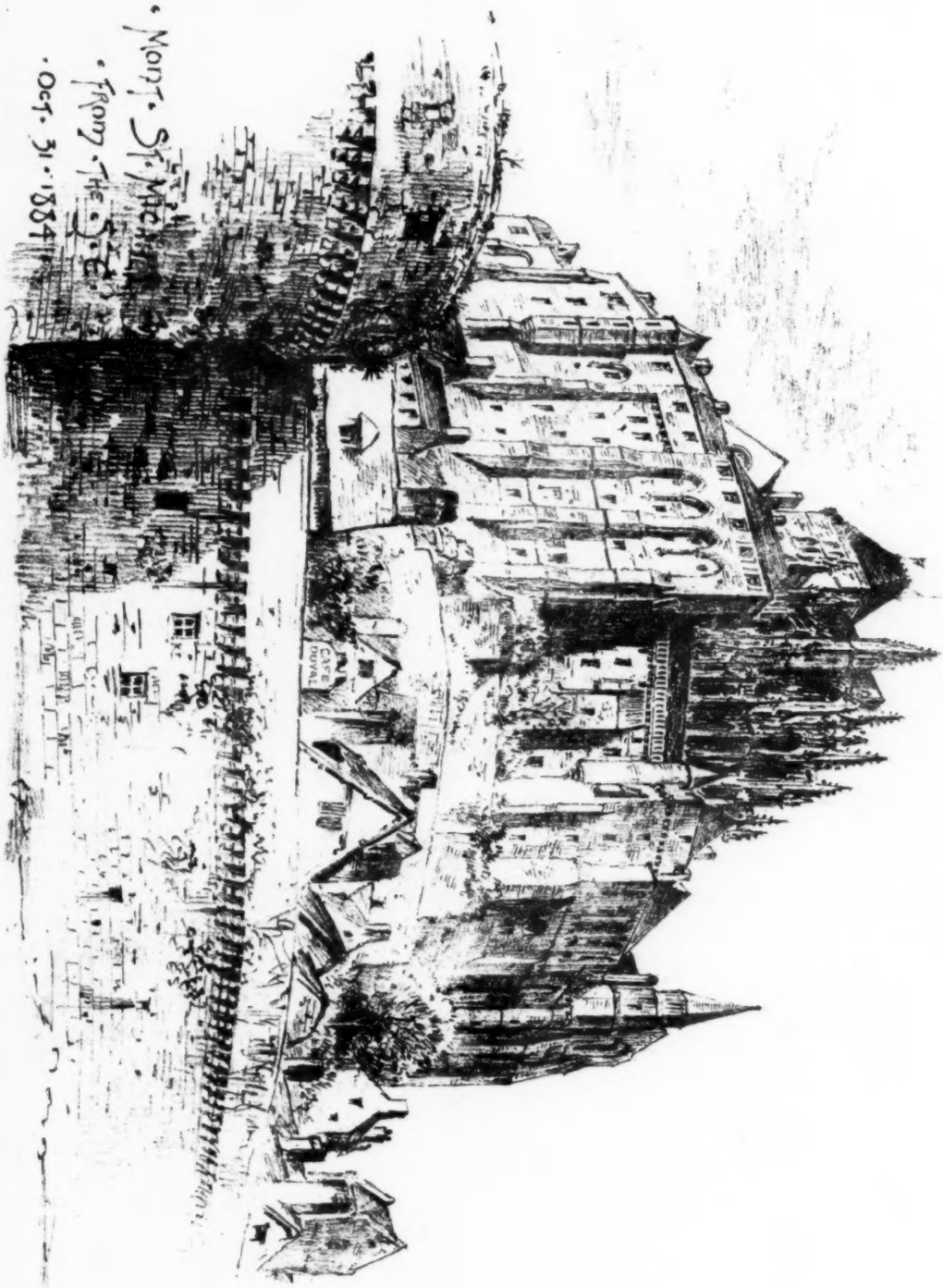

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MONT ST. MICHAEL.

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direct sunlight would be sufficient to effect visible deterioration. Probably, indeed, more actual mischief may be caused by accidental exposure to the direct rays of the sun during so short a time even than would be the case in a series of years in the low half-light of an ordinary apartment. . . .

If absolute immunity from the bleaching effects of light could be secured for the pigments made use of, so many and weighty are the recommendations and advantages of the water-color process that I incline to think it would on the whole be even preferable as a means of art to oil painting.

Oil painting is a vastly more complex, cumbersome and tedious process, yet not necessarily a more durable one, and it may be questioned whether it has any inherent charms or physical capabilities which the water-color process, as carried out in these days, does not possess in equal measure. One thing, however, is certain, and it is desirable to place it in a clear light, whatever may be the especial drawbacks of the art, oil pictures are much less liable to deterioration from the influence of light than water-color drawings as they have been heretofore executed. There are, as a matter of fact, in oil painting counteracting agencies at work, tending to neutralize more or less, according to circumstances, the fading influence of light on the colors employed. One of these causes of greater stability in the pigments is probably the fact that they are employed in much greater volume than in water-color painting In the latter process the tints are for the most part mere washes or stains of impalpable tenuity; in oil paintings, on the contrary, the colors are often "piled up," or loaded, in quite measurable thickness; there is therefore a much greater substance of coloring matter for the light to act upon. More efficacious still, in the sense of preservation, is the fact that the coloring substances in oil painting are effectually enveloped or "locked up" with the oils and varnishes with which they are mixed, the separate particles being each surrounded with a protecting medium in the oil or varnish employed, vastly more solid and efficacious than the gum or size which binds together the coloring atoms in water-color painting. It is true that the oleo-resinous vehicles of oil-painting are in other ways themselves the causes and media of decay and alteration often as fatal to the artist's work as light is to water-color pictures, but to go into this matter would involve a separate treatise.

To the fading of pigments, however, these oleo-resinous enveloping vehicles oppose a direct resistance in another way. Whilst it is untrue—physically impossible, in fact—that simple water-color pictures can deepen in tone by age, it is, on the other hand, just as certain that oil pictures do become darker in aspect as time goes on; but this increasing depth of tone is caused in most instances mainly, and in every instance to a great extent, by the alteration in color of the oleo-resinous vehicles, not by any mutation of the pigments locked up in them, which latter, if they undergo any alteration at all, change in the sense of diminution, not increase, of intensity of tint. Oils and varnishes, though often quite colorless at first, undergo inevitable chemical changes, accelerated or retarded, superinduced, and even remedied again by modifying external influences. They absorb oxygen from the air, and a process analogous to the slow combustion of their particles takes place, the result being that the originally colorless vehicles gradually acquire a yellow or brown tint of varying degrees of intensity, and tend to become more or less turgid and opaque. This darkening process goes on most rapidly in the dark, and it is retarded or remedied again by re-exposure to light. A bleaching action, in fact, is then established. As I have intimated I am no authority on the actinic properties of light. The processes of photography have, however, made certain phenomena familiar to us. Everybody knows that it is the rays at the blue end of the spectrum which bleach and disintegrate, whilst the yellow and red rays are inert or protective. . . .

From this it results that whilst it is good for water-color drawings that they should be kept in the dark as much as possible, in portfolios rather than in glazed frames exposed to the light, it is, on the contrary, bad for oil pictures to hang them in dark corners, or for periods of time in shut-up rooms, the privation of light in those cases bringing about increasing darkness, dullness and opacity.

The action of the electric-light on water-color pigments is a question of much interest, and it is greatly to be desired that some competent scientific authority should practically investigate it. The feasibility of the exhibition of water-color drawings in our public collections literally depends upon a favorable solution of this question, for nothing is more certain than that the continuous exhibition of water-color drawings of past epochs by daylight inevitably entails their rapid, irremediable, and more or less complete and final deterioration. It is not unlikely that the white or bluish "arc" light would, though in a far less degree, be as destructive as the sun's light to mutable pigments; but the yellow "incandescent" light, on the contrary, would probably be found to exercise no perceptible bleaching influence. . . .

I observe that a recent writer on artists' pigments states that bistre and sepia are stable and reliable colors; but in this I differ from him entirely, and I apprehend that his observations and experiments have not extended over a sufficient range and length of time to have enabled him to ascertain the real truth of the matter. A very pertinent, and indeed amusing, instance in illustration of the fugacious nature of bistre and sepia (it is not easy, by the way, to decide in all cases which of these colors has been employed) occurs to me on the spur of the moment. In the Oxford University collection of drawings by the ancient masters is a large bistre pen-drawing, an elaborate copy of Michael Angelo's "Last Judgment," by a contemporary sixteenth-century artist. This drawing has been exposed to the light for a long period under glass, both at Oxford and before it came there; consequently it has waned and dwindled to a very pale and shadowy status. One figure in the composition, and the only, nevertheless retains its pristine force of tint, standing out like a dark rock against a vaporous sky. This is the figure of Charon, on the lower part of the composition, ferrying over condemned souls in his boat, and striking them with his oar. The fact is, the simple-minded artist, anxious to invest the evil one with superabundant terror, drew the grisly fiend with black pigment, doubtless Indian ink or lamp-black, and this color, being in its nature quite unchangeable, has stood its ground perfectly whilst all the rest of the work executed in bistre has almost faded off the paper. Thus the devil in this instance at all events remains just as black as he was painted!

Sir James Linton and others have alluded to the behavior of two pigments very frequently used in combination by the English water-colorists of the earlier part of the present century. These are Indian red and indigo, chiefly employed to form compound tints, in skies, distances, etc., of varying degrees of cool gray and purple. The strangest possible changes have taken place in many of the drawings in which these colors have been made use of. Cold gray skies with dark rolling clouds and distant purple mountains, for instance, have been utterly transformed and metamorphosed; they have often become bright "foxy" red: in short, the effect of brilliant, glowing sunsets has sometimes replaced that of the lowering skies originally depicted. . . .

I had intended to go especially into the question of the state of conservation of the drawings of the greatest of all water-colorists—Turner—but space warns me to be brief. Now I yield to no man in my admiration of that immortal artist, and the undeniable deterioration of his admirable drawings has long been a source of pain and regret to me. It was, then, with no little surprise that I found myself taken to task in the *Times* by no less an authority than Mr. Ruskin for having alluded to the faded condition of the beautiful Turner drawings, exhibited at the last Royal Academy winter exhibition. So far as I could understand the gist of Mr. Ruskin's letter it was to minimize or call in question the reality of the changes in the Turner's drawings, which nevertheless were only too obvious, and had notoriously been the subject of universal discussion by hundreds and thousands of sympathetic and disinterested observers.

In regard to this matter, however, I cannot do better than call in the assistance of a high authority who had repeatedly brought this subject to public notice years before, and that in so lucid and emphatic a manner as to dispense me entirely from adding anything further of my own. I shall, then, in bringing this paper to a conclusion, simply quote and fully endorse the statements and opinions so well expressed by my fellow laborer and predecessor in the field.

In the *Literary Gazette* of November 13, 1858, this writer, after describing the particular method of preserving the water-color drawings of Turner from the influence of light, says:

> You will find that the officers of the Louvre and the British Museum refuse to expose their best drawings or missal pages to light, in consequence of ascertained damage received by such drawings as have been already exposed; and among the works of Turner I am prepared to name an example in which the frame having protected a portion whilst the rest was exposed, the covered portion is still rich and lovely in colors, whilst the exposed spaces are reduced in some parts nearly to white paper, and the color in general to a dull brown. . . .
>
> Again, Turner's drawings, now national property,
>
> were all kept by him in tight bundles or in clasped books; and all the drawings so kept are in magnificent preservation, appearing as if they had just been executed, whilst every one of those which have been in the possession of purchasers and exposed in frames, are now faded in proportion to the time and degree of their exposure; the lighter hues disappearing, especially from the skies, so as sometimes to leave hardly a trace of the cloud forms.[1] For instance, the great Yorkshire series is, generally speaking, merely the wreck of what it once was. That water-color drawings are not injured by darkness is also sufficiently proved by the exquisite preservation of missal paintings, when the books containing them have been little used.

Eighteen years after the above remarks appeared the same writer reaffirmed his convictions on the subject in a letter which appeared in the *Daily Telegraph* (July 5, 1876). He there tells us again of the proper way to preserve the drawings of Turner. They are to be framed and glazed, and kept, when they are not actually being looked at, in portable cabinets, where they are

> never exposed to the light. . . . Thus taken care of, and thus shown, the drawings may be a quite priceless possession to the people of England for the next five centuries; whereas those exhibited in the Manchester Exhibition were virtually destroyed in that single summer. There is not one of them but is the mere wreck of what it was. I do not choose to name destroyed drawings in the possession of others; but I will name the vignette of the Plains of Troy in my own, which had half the sky baked out of it in that fatal year, and the three drawings of Richmond (Yorkshire), Egglestone Abbey and Langharne Castle, which have had, by former exposure to light, their rose colors entirely destroyed, and half of their blues, leaving nothing safe but the brown. . . . The public may, therefore, at their pleasure, treat their Turner drawings as a large exhibition of fireworks, see them explode, clap

[1] The cloud forms, which have disappeared from the drawings, may be seen in the engravings.

their hands, and have done with them; or they may treat them as an exhaustless library of noble learning.

Lastly, in a brief note which appeared in the *Daily Telegraph* of July 19, 1876, still the same writer repeats "that no water-color work of value should ever be constantly exposed to light."

Now what is the name of this outspoken and, as I hold, most discerning writer? None other than *John Ruskin!*[1]

Surely, then, some counterfeit Ruskin must have penned these lines in the *Times* of April 14, this year:

> Out of direct sunlight it (a water color drawing) will show no failing on your room wall till you need it no more. We may wisely spend our money for true pleasures that will last our time or last even a very little part of it; and the highest price of a drawing which contains in it the continuous delight of years cannot be thought extravagant as compared to that we are willing to give for a melody that expires in an hour.

Truly, the worth of a Turner drawing set against that of a single tune on the fiddle! — J. C. Robinson *in the Nineteenth Century.*

FLAME CONTACT.— A NEW DEPARTURE IN WATER HEATING.[2]

IT is my intention to prove to you, on theoretical ground, and also by experimental demonstration, in such a manner as will admit of no possible doubt, that the present accepted system of water heating by gaseous or other fuel, is a very imperfect means for an end, and is, both in theory and practice, essentially faulty. My statements may appear bold, but I come prepared to prove them in a manner which I think none of you will question, as the matter admits of the simplest demonstration. I will, in the first place, boil a specified quantity of water in a flat-bottomed vessel of copper; the time required to boil this you will be able to take for yourselves, as the result will be visible by the discharge of a strong jet of steam from the boiler. I will then take another copper boiler of the same form, but with only one-half the surface to give up its heat to the water, and will in this vessel boil the same quantity of water with the same burner in a little over one-half the time, thus about doubling the efficiency of the burner, and increasing the effective duty of the heating-surface nearly fourfold, by getting almost double the work from one-half the surface.

The subject is a comparatively new one, and my experiments are far from complete on all points; but they are sufficiently so to prove my case fully. As no doubt you are all aware, it is not possible to obtain flame contact with any cold, or comparatively cold surface. This is readily proved by placing a vessel of water with a perfectly flat bottom over an atmospheric gas burner; if the eye is placed on a level with the bottom of the vessel a clear space will be seen between it and the flame. I cannot show this space on a lecture table to an audience; but I can prove its existence by pasting a paper label on the bottom of one of the boilers, and exposing this to the direct impact of a powerful burner during the time the water is being boiled, and you will see that it comes out perfectly clean and uncolored. Now, it is well known that paper becomes charred at a temperature of about 400° Fahrenheit, and the fact my test-paper is not charred proves that it has not been exposed to this temperature, the flame being, in fact, extinguished by the cooling power of the water in the vessel. I need hardly remind you that the speed with which convected or conducted heat is absorbed by any body is in direct ratio to the difference between its own temperature and that of the source of heat in absolute contact with it; and, therefore, as the source of the heat taken up by the vessel is nothing but unburnt gases, at a temperature below 400° Fahrenheit, the rate of absorption cannot, under any circumstances, be great, and the usual practice is to compensate for this inefficiency by an enormous extension of surface in contact with the water, which extension I will prove to you is quite unnecessary.

You will see I have here a copper vessel with a number of solid copper rods depending from the lower surface; each rod passes through into the water space and is flattened into a broad head, which gives up its heat rapidly to the water. My theory can be stated in a few words: The lower ends of the rods, not being in close communication with the water, can, and do attain a temperature sufficiently high to admit of direct flame contact, and as their efficiency, like that of the water surface, depends on the difference between their own temperature and that of the source of heat in absolute contact with them, we must, if my theory is correct, obtain a far greater duty from them. I do not wish you would take anything for granted; and although the surface of the rods, being vertical, can only be calculated for evaporating power at one-half that of a horizontal surface, as is usual in boiler practice, my margin of increased duty is so great that I can afford to ignore this, and to take the whole at what its value would be as horizontal surface, and still obtain a duty fifty per cent greater from a surface which is the same in area as the flat-bottomed vessel on the fireside, but having only one-third the surface area in contact with the water. I do not, of course, profess to obtain more heat from the fuel than it contains, but simply to utilize that heat to the fullest possible extent by the use of heating surfaces beyond comparison smaller than what have been considered necessary, and to prove not only that the heating surface can be concentrated in a very small area, but also that its efficiency can be greatly increased by preventing close water contact, and so permitting combustion in complete contact with a part of the heating surface. I will now boil forty ounces of water in this flat-bottomed copper vessel, and, as you will see, sharp boiling begins in three minutes fifteen seconds from the time the gas is lighted. The small quantity of steam evolved before this time is of no importance, being caused partly by the air driven off from the water and partly from local boiling at the edges of the vessel, owing to imperfect circulation. On the bottom of this vessel is pasted a paper label which you will see is untouched by the flame, owing to the fact that no flame can exist in contact with a cold surface. It may be thought, that, owing to the rapid conducting power of copper, the paper cannot get hot enough to char. This is quite a mistake, as I will show you by a very curious experiment. I will hold a small plate of copper in the flame for a few seconds, and will then hold it against the paper. You will see that, although the copper must of necessity be at a temperature not exceeding that of the flame, it readily chars the paper.

We can, by a modification of this experiment, measure the depth of the flameless space, as the copper, if placed against the paper before it has time to be previously heated, will, if not thicker than one-fortieth of an inch, never become hot enough to discolor the paper, showing that the flame and source of heat must be below the level of a plate of metal this thickness. In repeating this experiment I must caution you to use flour paste, not gum, which is liable to swell and force the paper past the limit of the flameless space, and also to allow the paste to dry before applying the flame, as the steam formed by the wet paste is liable also to lift the paper away and force it into the flame. I will now take this vessel, which has only one-half the surface in contact with the water, the lower part being covered with copper rods, three-sixteenths of an inch in diameter, one-half inch centres apart, and one and one-half inches long, and you will see that with the same burner as before, under precisely the same conditions, sharp boiling takes place in one minute fifty seconds, being only thirteen seconds more than half the time required to produce the same result with the same quantity of water as in the previous experiment. Although the water surface in contact with the source of heat is only one-half that of the first vessel and the burner is the same, we can see the difference not only in the time required to boil the forty ounces of water, but also in the much greater force and volume of steam evolved when boiling does occur. With reference to the form and proportions of the conducting rods, these can only be obtained by direct experiment in each case for each distinct purpose. The conducting power of a metallic rod is limited, and the higher the temperature of the source of heat, the shorter will the rods need to be, so as to insure the free ends being below a red heat, and so prevent oxidation and wasting. There are also other reasons which limit the proportions of the rods, such as liability to choke with dirt and difficulty of cleaning, and also risk of mechanical injury in such cases as ordinary kettles or pans; — all these requirements need to be met by different forms and strengths of rods to insure permanent service, and, as you will see further on, by substituting in some cases a different form and type of heat conductor.

To prove my theory as to the greater efficiency of the surface of the rods in contact with the flame as against that in direct contact with the water, I have another smaller vessel which, including the rods, has the same total surface in contact with the flame, but only one-third the water surface as compared with the first experiment. Using again the same quantity of water and the same burner, we get sharp boiling in two minutes ten seconds, being an increase of duty of fifty per cent, with the same surface exposed to the flame. The rods in the last experiment form two-thirds of the total heating surface, and if we take, as I think for some careful experiments we may safely do, one-half the length of the rods to be at a temperature which will admit of direct flame contact, we have here the extraordinary result that flame contact with one-third of the heating-surface increases the total fuel duty on a limited area fifty per cent. This really means that the area in contact with the flame is something like six times as efficient as the other. In laboratory experiments it is necessary not only to get your result, but to prove your result is correct, and the proof of the theory admits of ready demonstration in your own laboratories, although it is unfit for a lecture experiment, at all events, in the only form I have tested it.

If you will take two ordinary metal ladles for melting lead, cover the lower part of one of these with the projecting rods or studs and leave the other plain, you will find, on melting a specified quantity of metal in each, that the difference in duty between the two is very small. The slight increase may be fully accounted for by the difference in the available heating surface reducing the amount of waste

[1] For further and equally-explicit utterances in the same sense, see *Arrows of the Chase*, 1880, section 4.

[2] By Thomas Fletcher, F.S.C. Gas Institute Meeting, London, June 9, 1886.

heat passing away, and this proves that flame contact, and therefore quick absorption of heat, takes place on plain surfaces as soon as these are above a certain temperature, which, in a metal ladle, very soon occurs. What the temperature is which admits of flame contact I have, as yet, not been able to test thoroughly, and it will need some consideration how the determination of this is to be correctly made; at the same time it is a question of physics which should be capable of being answered. Let us now take the other side of the question. If the efficiency of a surface depends on flame contact, there must, of course, be flame, or, at least, gases of an extremely high temperature, and we therefore cannot expect this extraordinary increase of efficiency in any part of our boiler except where flame exists, and if these projections are placed in a boiler, anywhere except in contact with flame, their efficiency must be reduced to that of ordinary heating surface. They are, of course, useful, but only in the same way as ordinary flue surface.

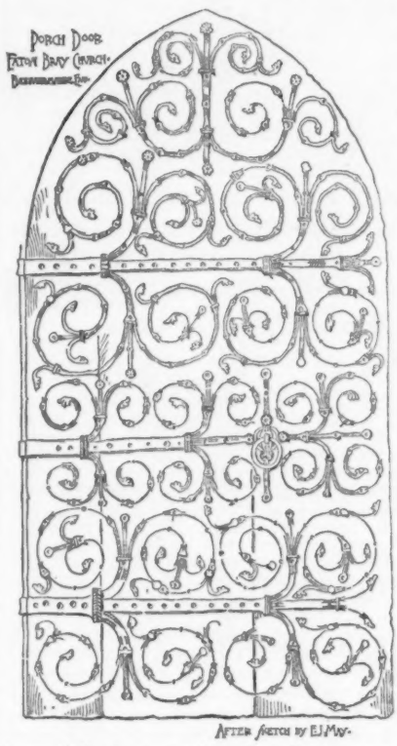
When we come to boilers for raising steam, which have to stand high pressures, we come to other difficulties of a very serious nature, which require special provision to overcome them. To put such rods as I have referred to in a boiler-plate necessitates the plate being drilled all over with holes, causing a dangerous source of weakness, as the rods cannot be used as stays; further than this, they would render really efficient examination a matter of extreme difficulty, and would be liable to give rise to frequent and almost incurable leakages; but there is, fortunately, a very simple way to overcome this difficulty. I have found that rods or points, such as I have described, are not necessary, and that the same results can be obtained by webs or angle-ribs rolled in the plates. My experiments in this direction are not complete, and at present they tend to the conclusion that circular webs, which would be of the greatest efficiency in strengthening the flues, are not so efficient for heating as webs running lengthways with the flue, and in a line with the direction of the flame. This point is one which I am at present engaged in testing with experimental boilers of the Cornish and Lancashire type, and, as we have in gas a fuel which renders every assistance to the experimenter, it will not take long to prove the comparative results obtained by the two different forms of web. Those of you who have steam boilers will, no doubt, know the great liability to cracking at the rivet holes in those parts where the plates are double; this cracking, so far as my own limited experience goes, being usually, if not always, on the fire side, where the end of the plate is not in direct contact with the water, where it is, in fact, under the conditions of one of the proposed webs. I think we may safely come to the conclusion that this cracking is caused by the great comparative expansion and contraction of the edge of the plate in contact with the fire, and it will probably be found that if the plates are covered with webs, the whole of the surface of the plates will be kept at a higher and more uniform temperature, and the tendency to cracks at the rivet-holes will be reduced. This is a question not entirely of theory, but needs to be tested in actual practice.

There is another point of importance in boilers of the locomotive class, and those in which a very high temperature is kept in the fire-box, and this is the necessity of determining by direct experiment the speed with which heat can safely be conducted to the water without causing the evolution of steam to be so rapid as to prevent the water remaining in contact with the plates, and also whether the steam will or will not carry mechanically with it so much water as to make it objectionably wet, and cause priming and loss of work by water being carried into the cylinders. I have observed, in the open boilers I use, that when sufficient heat is applied to evaporate one cubic foot of water per hour from one square foot of boiler surface, the bulk of the water in the vessel is about double, and that the water holds permanently in suspension a bulk of steam equal to itself.

I have, as yet, not had sufficient experience to say anything positively as to the formation or adhesion of scale on such surfaces as I refer to, but the whole of my experimental boilers have, up to the present, remained bright and clean on the water surface, being distinctly cleaner than the boiler used with ordinary flat surfaces. It is, I believe, generally acknowledged that quick heating and rapid circulation prevents, to some extent, the formation of hard scale, and this is in perfect accord with the results of my experiments.

The experiments which I have shown you, I think, demonstrate beyond all question that the steaming power of boilers in limited spaces, such as our sea-going ships, can be greatly increased; and when we consider how valuable space is on board ship, the matter is one worthy of serious study and experiment. It may be well to mention that some applications of this theory are already patented. I will now show you, as a matter of interest, in the application of coal gas as a fuel, how quickly a small quantity of water can be boiled by a kettle constructed on the principle I have described, and to make the experiment a practical one I will use a heavy and strongly-made copper kettle which weighs six and one-half pounds, and will hold, when full, one gallon. In this kettle I will boil a pint of water, and, as you see, rapid boiling takes place in fifty seconds. The same result could be attained in a light and specially-made kettle in thirty seconds, but the experiment would not be a fair practical one, as the vessel used would not be fit for hard daily service, and I have therefore limited myself to what can be done in actual daily work rather than laboratory results, which, however interesting they may be, would not be a fair example of the apparatus in actual use at present.

THE GEOLOGY OF THE EARTH'S SURFACE IN ITS SANITARY ASPECT.



FROM an interesting paper read by Professor W. Fream at a recent meeting of the Surveyors' Institution [London], on "The Geology of the Surface in its Practical Aspects," the following passages are taken: —

"A full knowledge of the nature and distribution of the superficial deposits is a necessary preliminary to a thorough comprehension of local conditions favorable to water supply and drainage. Water derived from surface springs is always more or less open to suspicion, and the recent progress of medical and sanitary science has indicated clearly enough the nature of the dangers which may lurk in drinking-water obtained from such sources. The growing density of the population is, even in rural districts — perhaps I ought to say *particularly* in rural districts — calculated to increase rather than to diminish this source of danger. Cases in which shallow wells have run dry when adjacent cesspools have been abolished are by no means hypothetical, and filtration through a few feet or yards of porous, sandy or gravelly rock is utterly inoperative against organic poisons. The establishment or maintenance of ponds is another important matter, especially in agricultural districts; it is a circumstance which is largely dependent on the character of the soil and subsoil, and on the nature of the available sources of water-supply.

"The unhealthy character of some districts is associated with the nature of the soils, and it may be regarded as an established fact that certain classes of diseases are specially addicted to certain soils. On soils pervious to water the prevailing diseases are of the enteric or typhoid type; on impervious soils they are consumption and other lung diseases, and rheumatism. In the former case foul drinking-water obviously suggests itself as the medium of contagion, for when the level of the ground water is low, percolation is free, and then it is that most of the zymotic diseases are rife. Professor Pettenkofer's continuous daily observations on the height of the ground water at Munich demonstrated that when the ground water fell the death rate rose, typhoid fever in particular inducing fatal results. Not long ago Mr. Baldwin Latham prepared a diagram showing the connection between low ground-water and typhoid fever at Croydon. The ground-air, moreover, is as important from a hygienic point of view, particularly in relation to dwelling-houses, as is the ground water. The quantity of ground air varies with the nature of the soil, being least in clays, more in loams, and most in sands or gravels; it varies, also, with the quantity of moisture in the soil, and, in any given soil, it approaches the maximum when the ground-water is at its lowest. The circulation of air in the soil is greatly influenced by the temperature and pressure of the atmosphere, and a falling barometer is a danger signal, bidding us beware lest the offensive gaseous emanations from defective drains and cesspits should be given off at the surface of the ground, and perchance beneath the dwelling-rooms of a house, where the draught caused by fires will aid in determining the course of the effluvia. Dr. J. W. Tripe, Medical Officer of Health for Hackney, has traced the path of injurious gases through more than thirty feet of loose soil. Some years ago, Mr. G. J. Symons, F. R. S., Secretary of the Royal Meteorological Society, advocated the collection, by a commission of experts, of a complete statistical record of the health rate, death rate, geology, climate, water-supply, drainage, and general conditions of all our mineral-water, sea-bathing, or pure-air resorts; and he maintains that the collection of such statistics would have both direct and indirect beneficial effects infinitely beyond the cost of the inquiry. The temperature both of soil and of ground-water is obviously a matter of importance.

"The reason that sandy and gravelly soils have usually received town populations before clayey ones — a fact which was well illustrated during the settlement of the metropolitan districts—is that, on the former, water was as easy to obtain as, on the latter, it was

frequently difficult; the sanitary differences between the two kinds of soil are branches of very recent knowledge. So intimate is the relation between the geology of the surface and the conditions controlling health, that the University of London, in its 'Examination in Subjects relating to Public Health,' which is open only to its graduates in medicine, requires candidates to give evidence of a knowledge of 'Geology, as regards general knowledge of Rocks, their conformation and chemical composition, and their relation to underground Water, and to drainage and sources of Water-supply.' Among legislative enactments, the Rivers Pollution Prevention Act is not without interest and significance in the same connection."

A PHARAOH'S HOUSE FOUND IN A CORNER OF THE DELTA.

A VERY curious and interesting discovery has been made in the loneliest and dreariest corner of the Northeastern Delta. In a land where previous explorers have found only temples and tombs — the monuments of an extinct faith and the graves of a dead nation —Mr. Flinders Petrie has lighted upon the ruins of a royal palace. Not a palace of the dubious pre-historic Byzantine sort, but a genuine and highly-respectable structure, with an unblemished pedigree and a definite place in the history of four great nations. In a word, the fortunate finder of Naukratis has for the last six or eight weeks been working upon a large mound, or group of mounds, called Tell Defenneh, which Egyptologists and historians have long identified with the "Pelusiac Daphnæ" of the Greek writers and the "Taphanhes" of the Bible. Here he has discovered the ruins of that very palace to which, as recorded in the Book of the Prophet Jeremiah (chapter 43), Johanan, the son of Kareah, followed by "all the Captains of the forces" and "the remnant of Judah," brought the fugitive daughters of Zedekiah, then dethroned and mutilated captive in Babylon. This flight of the Hebrew Princesses took place about B. C. 585, during the reign of Ua-ab-Ra (twenty-sixth Egyptian dynasty), whom the Hebrews called Hophra and the Greeks Apries. The Pharaoh received them with hospitality. To the mass of Jewish immigrants he granted tracts of land extending from Taphanhes to Bubastis, while to the daughters of Zedekiah, his former ally, he assigned this royal residence, which the Bible calls "Pharaoh's house in Taphanhes."

At the time when these events happened the whole of this part of the Delta, to the westward as far as Tanis (San), to the southward as far as the Wady Tûmilât, was a rich pastoral district, fertilized by the annual overflow of the Pelusiac and Tanitic arms of the Nile. It is now a wilderness, half marsh, half desert. Toward the eastern extremity of this wilderness, in the midst of an arid waste relieved by only a few sand-hills overgrown with stunted tamarisk bushes, lie the mounds of Defenneh. Far from roads, villages, or cultivated soil, it is a place which no traveller goes out of his way to visit, and which no explorer has hitherto attempted to excavate. Sixteen miles of marsh separate it on the one side from Tanis, while on the other the horizon is bounded by the heron-haunted lagoons of Lake Menzaleh and the mud-swamps of the plain of Pelusium. The mounds consist of three groups situate from half a mile to a mile apart, the intermediate flat being covered with stone-chips, potsherds, and the remains of brick foundations. These chips, potsherds, and foundations mark the site of an important city in which the lines of the streets and the boundaries of two or three large inclosures are yet visible. Two of the mounds are apparently mere rubbish heaps of the ordinary type; the third is entirely composed of the burned and blackened ruins of a huge pile of brick buildings, visible, like a lesser Birs Nimroud, for a great distance across the plain. Arriving at his destination toward evening, footsore and weary, Mr. Petrie beheld this singular object standing high against a lurid sky and reddened by a fiery sunset. His Arabs hastened to tell him its local name, and he may be envied the delightful surprise with which he learned that it is known far and near as "El Kasr el Bint el Yahudí — the Castle of the Jew's Daughter."

Seeing at once that the interest of the place centred in this "Kasr," Mr. Petrie forthwith pitched his camp at the foot of the slope, between the tamarisks and the right bank of a brackish canal which intersects the outskirts of the mound and expands somewhat higher up into two good-sized lakes. The place being literally in the midst of an uninhabited desert, he had brought with him a patriarchal following of Nebesheh folk — men, boys, and girls — some forty souls in all, to say nothing of camels and baggage. Want of space forbids us to follow Mr. Petrie step by step in his work of exploration; enough that he at once concentrated his forces upon the "Kasr," which has now been so thoroughly cleared out and cleared up that not only its architectural structure, but its history has been rescued from oblivion.

The building was first a stronghold, quadrangular, lofty, massive; in appearance very like the keep of Rochester Castle. It contained sixteen square chambers on each floor, both the outer walls and partition walls being of enormous strength. It is, of course, impossible to guess of how many stories it was originally composed; but the bulk of the mound consists of its débris. This stronghold was built by Psammetichus I, whose foundation deposits (consisting of libation vessels, corn-rubbers, specimens of ores, model bricks, the bones of a sacrificial ox and of a small bird, and a series of little tablets in gold, silver, lapis-lazuli, jasper, cornelian, and porcelain, engraved with the royal name and titles) have been discovered by Mr. Petrie under the four corners of the building. The name of the founder being thus determined, we at once know for what purpose the castle was erected. What the excavations have disclosed is, however, still more curious. And here it is necessary to remember that the place is not merely a ruin, but a burned ruin, the upper portions of which have fallen in and buried the basements. Furthermore, it was plundered, dismantled, and literally hacked to pieces before it was set on fire. The State rooms, if one may use so modern a phrase, were lined with slabs of fine limestone covered with hieroglyphic inscriptions, bas-relief figures of captives and the like, most delicately sculptured and painted. These now lie in heaps of splintered fragments, from among which Mr. Petrie has with difficulty selected a few perfect specimens. The whole place, in short, tells a tale of rapine and vengeance. It would be idle, under these circumstances, to hope for the discovery of objects of value among the ruins. Moreover, it was only in the basement-chambers, where things might have fallen through from above, or have been left *in situ*, that there seemed to be any prospect of "finds" for the explorer. Now, the basements were the offices, and some of these offices have been found intact under the superincumbent rubbish. There is certainly nothing very romantic in the discovery of a kitchen, a butler's pantry, and a scullery. It would be more satisfactory to find a throne-room or a treasure-chamber. Yet even these domestic *arcana* become interesting when they form part of an ancient Egyptian palace of twenty-five hundred and fifty-two years ago. The kitchen of "Pharaoh's house in Tahpanhes" is a big room, with recesses in the thickness of the walls, which served for dressers. Here some fourteen large jars and two large flat dishes were standing in their places, unharmed amid the general destruction. A pair of stone corn-rubbers, a large iron knife, various weights, and three small flat iron pokers — or possibly spits — were also found in this room. The butler's pantry, it need scarcely be said, was the room to which wine jars were brought from the cellars to be opened. It contained no amphoræ, but hundreds of jar lids and plaster amphoræ stoppers, some stamped with the royal ovals of Psammetichus, and some with those of Necho, his successor. Here, also, was found a pot of resin. The empty amphoræ, with quantities of other pottery, mostly broken, were piled in a kind of rubbish depot close by. Some of those amphoræ have the lute-shaped hieroglyph signifying "nefer" (good) scrawled three times in ink upon the side, which, not to speak it profanely, may probably indicate some kind of "XXX" for Pharaoh's consumption. Most curious of all, however, is a small room evidently sacred to the scullery maid. It contains a recess with a sink, a built bench to stand things upon, and recesses in the wall by way of shelves, in which to place what has been washed up. "The sink," writes Mr. Petrie, "is formed of a large jar with the bottom knocked out and filled with broken potsherds placed on edge. The water ran through this, and then into more broken pots below, placed one in another, all bottomless, going down to the clean sand some four or five feet below." The potsherds in this sink were covered with organic matter and clogged with fish-bones.

In other chambers there have been found large quantities of early Greek vases, ranking from B. C. 500 to B. C. 600, some finely painted with scenes of gigantomachia, chimeras, harpies, sphinxes, processions of damsels, dancers, chariot races, and the like, nearly all broken, but many quite mendable; also several big amphoræ with large loop handles, quite perfect. A sword handle with a wide curved guard, some scale armor, bronze rings, amulets, beads, seals, small brass vessels, and other minor objects of interest have also turned up, and two rings engraved with the titles of a priest of Amen. Some small tablets inscribed with the name of Amasis (Ahmes II), and a large bronze seal of Apries (Hophra), are important, inasmuch as they complete the name-links in the historic chain of the twenty-sixth Dynasty. . . .

To identify Jeremiah's stones (unless he had first inscribed them, which is unlikely) would, of course, be impossible. Yet Mr. Petrie has looked for them diligently, and turned up the brickwork in every part. Some unknown stones have, indeed, been dug out from below the surface, and it is open to enthusiasts to identify them, or not, as they think fit, but about the "Balât" it is scarcely possible that there should be a difference of opinion. Did Nebuchadrezzar really come to Taphanhes and spread his royal pavilion on that very spot, and was Jeremiah's prophecy fulfilled? Egyptian inscriptions say that he came, and that Apries defeated him; Babylonian inscriptions state that he conquered, and the truth is hard to discover. At all events, there are three clay cylinders of Nebuchadrezzar in the Museum at Boulak inscribed with the great king's name, titles, parentage, etc., which there is much reason to believe were found a few years ago at this place, and not as the Arab sellers stated, at Tussún,

on the isthmus. Such cylinders were taken with him by Nebuchadrezzar in his campaigns for the purpose of marking the place where he planted his standard and throne of victory.—*London Times, June* 18.

COMMUNICATIONS

[*We cannot pay attention to the demands of correspondents who forget to give their names and addresses as guaranty of good faith.*]

SIR EDMUND BECKETT AGAIN.

NEW YORK, June 28, 1886.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—For years there has been no better fun than reading Sir Edmund Beckett's lucubrations on art, particularly in its architectural field. He muddles whatever he handles with such stolid and thorough self-complacency that one is inevitably reminded of those very much mixed metaphors of Sir Boyle Roche, which have so long been prominent in the stock of our recurrent Joe Millers. It never occurred to me that his last pronunciamento was any more worth serious treatment than many preceding ones; but Mr. Leopold Eidlitz has thought it worth while to give it such treatment in your issue of Saturday, though, to be sure, it gives the latter an opportunity to insist, in a quite piquant way, on several self-evident points, to the advantage no doubt of some of your younger readers.

Sir Edmund has lately, it is understood, been posing for a peerage, and to gain his end naturally trades on the chief capital he has, *i. e.*, his reputation (however fairly or unfairly earned) among his official superiors for saving the public treasury from the wilfulness and extravagance of naughty architects; though indeed, when he talks of his walls nine feet thick it does look a little as if he might have fallen into over-lavish ways himself. But, it seems, "he likes walls like himself." He certainly does resemble dead stone walls, and very thick ones in more respects than one. It is really much to be feared that our obfuscated baronet in having "to do a good deal with architects" has necessarily received too many snubs from competent and self-respecting ones to make his word worth much when speaking of them *en masse*.

There are of course architects and architects, as there are competent, conscientious and modest lecturers and lecturers who for their own purposes injuriously transcend their "duty — all that is formally required of them," by venturing to instruct youth in what they convict themselves of knowing nothing or very little indeed about; and by poisoning their minds against a whole profession. It is certainly true that the mediæval architects overrated the functions of the arch, which, as the Arabs say, "never sleeps;" and that much of the ecclesiastical work was of poor construction, probably because it was controlled by superstitious, self-sufficient, sinecure clergy, having as agents perfunctory, officious, greedy commissioners-of-works *et hoc*, always in the way to show their self-importance and to absorb the funds, and thus prevent the real designers and experts from carrying out their plans properly. A few years ago, under the guidance of the contractor for repairs, I went over the uncovered foundation and other work of portions of Peterborough Cathedral, and found in it as thorough "scamp" work as I ever encountered in any modern construction. At another time, I saw unmistakable evidence of similar dishonest work in an ancient Italian cathedral, that of Pavia, I think. But no one believes that "the whole Institute of [British] Architects" recently wanted Sir Edmund Beckett to build a nine-inch wall where a nine-foot one was constructionally requisite; nor even that any middle-aged abbot of St. Alban's or his chief commissioner of works was stupid enough or money-grubbing enough to make a mistake covered by a discrepancy so wide, whatever superficial evidence to that effect may exist, after the changes of centuries, to the apprehension of the *dilettante* and placeman. It is much safer to assume that Sir Edmunds' "large arch" is really a small one, and that he does not understand the constructive laws for carrying thrust safely from one point to another, or the adequacy of buttresses and other abutments. For in nearly everything the Press has given us of Sir Edmund Beckett, he only affords another proof of the fact that every man, however great in his own estimation, is a fool outside of his rut (though of course some ruts are wider than others), as was very apparent when Professor Huxley gave an astonished world his surprising views on college façades, and more recently with other scientists and philosophers those on the Irish question.

But after all it is to be feared that Sir Edmund may conscientiously have some ground, not for his impertinent aspersions of a whole profession, the functions of which so complex, exacting and widely inclusive, and the finer qualifications for and results of which he is obviously incompetent to understand or deal with, but, for his evident impression that some architectural practitioners need watching as regards some points; just as chiefs of public work, commissions and *soi-disant* art lecturers need with respect to others, as much watching as may be convenient. And it would be quite in order for the (it is to be hoped) not yet exhausted pen of Mr. Leopold Eidlitz to give us some suggestions as to the best way of removing the impression, rife among the more unthinking portion of the public that—just as they assume that every clergymen is a hypocrite and every physician a quack, so—every architect is necessarily a mere draughtsman of pretty lines, and a spendthrift, for purposes of show and self-glorification, of other folks' money. Doubtless Mr. Eidlitz's facile pen could easily brush away such injurious assumptions, and produce before the bowed head of Sir Edmund and to the admiration of the public, those shining examples of practitioners who not only fill the bill—in his estimation — at all professional points, but in the moral field, which is always the final test-ground with any civilized community, show no taint or flaw whatever, no vanity or self-assumption, no egotism or greed, no undermining, no treachery; but only the keenest perception, in the midst of ignorance, inappreciation and Philistinism of the claims of the profession on its prominent and representative members, to the best fruits of modesty, disinterestedness, fraternity and public spirit.

A. J. BLOOR.

NOTES AND CLIPPINGS

THE LATERAN'S NEW APSE.—The new apse of the Lateran Basilica was inaugurated yesterday with much pomp. But for the fiction of his imprisonment the ceremony would have been performed by Leo XIII in person, for the Pope as such is Bishop of this basilica, which is proclaimed by an inscription in the portico to be the mother and head of all the churches of Rome and of the world. As it is, the Pope delegated his duties to Cardinal Monaco la Valletta, who celebrated the pontifical mass at the high altar. An excellent choir rendered the music, composed expressly for the occasion by Signor Capocci. The new apse, which is a massive and gorgeous piece of architecture, extends 67 feet beyond the old one. The entrance to it is formed by an arch decorated with mosaics supported by two columns. The principal achievement in the erection of the new apse has been the removal to it of the quaint thirteenth century mosaics which decorated the old one. This difficult task has been accomplished most successfully. The execution of the whole work has taken ten years. Large crowds of people of every condition and political party thronged the breezy aisles of the vast basilica to enjoy this ecclesiastical and artistic festa. The absence of the English tourist was conspicuous, but not strange, in view of the severe heat which has now set in.— *London Daily News.*

WHEN TO CUT TIMBER. — Many years ago two fences on a certain farm were made of common basswood rails, one of them with rails cut in winter and the other from trees felled at midsummer and at once split into rails. The former rotted more or less after some years, while the latter, or summer-cut rails, become hard like horn, and far outlasted those cut in winter. What was the reason of this difference? Simply this: The rails cut in winter were long in drying through the remaining months of winter and through spring; the sap partly fermented or soured and injured the texture of the wood, and unfitted it for lasting many years. The summer-cut rails were placed where they seasoned rapidly, and they became hard and horn-like. There are various theories about cutting timber when the "sap is up," and the "sap down," in connection with the proper time, but they are mostly errors. It is true there is less sap in a tree after it has been growing rapidly, the leaves evaporating in some degree the water in the sap-vessels, and the wood is consequently dryer than in spring before there is any outlet for the surcharged vessels through the leaves. But this is not the reason the summer-cut timber is most durable; it is simply from the rapid drying. Owners, therefore, who have timber to cut, may obtain a supply of more durable quality by cutting down and cutting up now, instead of next winter.— *St. Paul Pioneer Press.*

STRUCTURES ON COMPRESSIBLE FOUNDATIONS.— The subsoil at Chicago, U. S., is wet clay, and yielding to an extent which has caused serious difficulties in many of the heavier buildings by the unequal settlement. One of the most prominent examples is that of the United States Government building, which was built upon a bed of concrete three feet in thickness; the inequality of the pressure upon the foundations has caused an uneven subsidence, and many undesirable consequences have taken place. The concrete foundation has become broken, and cracks in various portions of the masonry, even to distortion of arches, and in two instances stones are reported to have dropped from the decorative work (on April 21) to the jeopardy of persons on the sidewalks around the building. As an example of what can be accomplished by the exercise of engineering skill under similar limiting conditions, the Home Insurance Company's building, in the same city is a fire-proof structure of great weight, being 160 feet in height, and constructed of masonry and iron. The foundation consists of independent piers built of alternate courses of dimension-stone and rubble, and the area of the bottom carefully proportioned to a surface of a square foot to each two tons of load to be supported by the pier. In this manner each basement pier and each vertical line of columns rested upon an independent foundation which was loaded to a uniform intensity per square foot. The beams and girders were very securely anchored together at walls and at intersections, and strips of band iron built into the masonry over arches and other places where reinforcement might be desirable. The whole building has subsided 2¼ inches, but owing to the care in placing loads of uniform intensity of stress upon the foundation, the maximum inequality in settlement has been only 11-16 inches. In our day and generation the wise men are not limited to those who build their houses upon a rock, but must include those who make the sand as stable in its resistence as a rock. The original peninsula comprising the city of Boston, U. S., has been distorted into some other geographical form, and more than double in area by filling over the harbor and estuaries by about 16 feet of gravel over the clay and mud forming the bottom. The large buildings constructed upon this "made land" have received the benefit of skilled engineers in regard to the distribution of the loads upon the piling which support the stone foundations, and bid fair to remain permanent

without any distortion, but many of the elegant private residences on the Back Bay district of the city, being erected under the sole direction of architects who did not avail themselves of the work of engineers familiar with that special branch, have settled irregularly, and many fine buildings are marred by cracks in walls and ceilings. This criticism does not apply in so great a measure to many of the later buildings where more judicious measures have been introduced to provide for uniform settling. The architects are not alone at fault here, for the abutment piers of a highway bridge over a railway on this district were moved laterally, foundations and all, some twelve years ago by the earth pressure caused by the approaches.— *Engineering.*

Barometric Wells.— Mr. J. S. Harding writes to *Symon's Meteorologicel Magazine* calling attention to the use which has been made in Switzerland of old wells for storm-warning purposes. He quotes from a recent monthly bulletin of the meteorological observatory of the Royal Institute of Riposto that in the village of Meyrin (Canton of Geneva), some disused wells have been hermetically sealed to serve as barometers to the people. An orifice of about an inch in diameter is made in the cover of the well, by which the internal air is put in communication with the external. When the air pressure outside diminishes upon the approach of a storm the air in the well escapes and blows a whistle in connection with the orifice, and in this way notice of a storm's approach is given to the inhabitants. If, on the contrary, the pressure increases, a different sound is produced by the entry of the air into the well, and the probability of fine weather is announced. The idea is a very good one for villages in which old disused wells can be had for this purpose. The indications afforded by the sound of the whistle might not in all cases be correct, and in some might be misleading, but in many cases they might prove valuable warnings. In our Western districts subject to tornadoes abandoned wells could be put to no better use than to admonish the people of these fatal storms.— *New York Herald.*

Mr. Ruskin on Church-building Debts.— The following is a copy of a letter received from Mr. Ruskin in reply to a circular asking him to subscribe to pay off the debt upon Duke-Street chapel, Richmond, S. W.:

Brantwood, Coniston, Lancashire, May 19, 1886.

Sir,—I am scornfully amused at your appeal to me, of all the people in the world the precisely least likely to give you a farthing! My first word to all men and boys who care to hear me is "Don't get into debt. Starve and go to heaven — but don't borrow. Try first begging — I don't mind, if it's really needful — stealing! But don't buy things you can't pay for!" And of all manner of debtors pious people building churches they can't pay for are the most detestable nonsense to me. Can't you preach and pray behind the hedges — or in a sand-pit — or a coal-hole — first? And of all manner of churches, idiotically built iron churches are the damnablest to me. And of all the sects of believers in any ruling spirit — Hindoos, Turks, feather idolators and mumbo-jumbo log-and-fire worshippers — who want churches your modern English evangelical sect is the most absurd and entirely unendurable to me! All which they might very easily have found out from my books — any other sort of sect would! — before bothering me to write to them. Ever, nevertheless, and in all this saying, your faithful servant,

John Ruskin.

Decay of Westminster Abbey.— In the early part of the last century parliament voted large sums toward the repair and completion of the abbey, and it was not until more than 500 years after its foundation that the building was finished by the completion of the two western towers in 1741. Again, from 1809 to 1821, sums amounting in all to £40,000 were expended by parliament on Henry VII's chapel. In point of fact the capitular revenues were never, even in pre-Reformation times, equal to the maintenance of so vast and costly a building; the church was always too large and magnificent for a mere monastery, and was maintained, at times very inadequately, by the bounty of successive sovereigns. From 1830 onward, however, the abbey estates became more lucrative, owing to the increase in value of the property held by the chapter in the northwestern suburbs of London, and for a time the chapter was comparatively rich. The necessity for a large and continuous expenditure on the maintenance and restoration of the external fabric had not, however, at that time been perceived; and when, in consequence of a series of acts passed between 1840 and 1868, the property of the abbey was transferred to the ecclesiastical commissioners and the revenues of the dean and chapter were commuted for a fixed sum, no sufficient provision was made for the cost of maintaining the fabric. The commutation scheme took full effect in 1869, when the late Dean Stanley was dean, and it provided for the annual payment of a certain sum of money to the dean and chapter, and for reconveyance to them of certain estates partly agricultural and partly situated in London. The revenue of the agricultural estates has not, however, proved as great as was anticipated, and altogether the arrangement made was one by which, as in other cases, the ecclesiastical commissioners seem to have profited at the expense of the dean and chapter. However this may be, it was certainly not foreseen at the time that the repairs and restorations necessary to preserve the abbey from ruinous decay would very shortly entail the expenditure of a sum estimated at from £60,000 to £80,000. In 1869 Sir Gilbert Scott had examined the abbey and had reassured the dean and chapter as to the general soundness of its condition. But some years afterward a fresh examination was made by Mr. Pearson, the well-known architect, who reported in March, 1882, that a process of decomposition was going on in the external fabric of the building, which, if not speedily arrested, must result in its ruin. From the time when this alarming report was received the dean and chapter have done their best with the limited funds at their disposal, and some of the most decayed portions of the fabric have been repaired; but the bulk of the work still remains to be done, and there are no funds to carry it on or even to meet the large deficit already incurred. We are satisfied that these facts only need to be generally known in order to induce parliament to take the steps which was necessary to preserve from imminent ruin a building so dear to the nation as Westminster Abbey.— *London Times.*

The Royal Palace at Madrid. — The royal palace of Madrid is one of the most colossal and one of the most magnificent royal residences in the world. The site which it occupies is said to be that of the original outpost Alcazar of the Moors, where Enrique IV resided. On the destruction of this by fire on Christmas eve, 1734, Philip V set on foot the construction of a residence which he intended to make into a rival of Versailles. The first design, by Felipe de Jubara, a Silician, was even of more ambitious dimensions than that actually carried out afterward by another architect, Giovanni Sacchetti, of Turin. This plan, though smaller and less costly than the original one, embraced the formation of a block of buildings 470 feet square and 100 feet in height, though the wings of the stupendous edifice have never been completed. So vast, indeed, are its dimensions, so noble its architectural design, and so splendid its internal decoration, that when Napoleon the Great paid a visit to Madrid to see his brother Joseph, whom he had made mock king of Spain, the grandeur and the splendor of the Palacia Real fairly took away the breath of the cold-blooded and cynical conqueror and art critic, who had sneeringly remarked of the cathedral of Strasbourg that it ought to be placed under a glass shade, and of the Duomo at Milan that its wondrous marble tracery would serve very well as a pattern for the laced border of a lady's pocket-handkerchief. On ascending the grand staircase he halted, turned to King Joseph and said: "Monsieur mon frère, you are better lodged than I am." — *London Telegraph.*

TRADE SURVEYS

The autumnal season, if it may be so termed already, has not for years opened with as favorable prospects as this one. The various commercial agencies make very encouraging reports, substantially agreeing in a twenty per cent reduction in the number of failures involving a capital of over $5,000, and a decrease of twenty-five to thirty-three per cent in the liabilities. These favorable prospects are not altogether reliable. It was the apprehensions more or less generally entertained early in the season that preserved a conservative policy among producing interests. The strike outbreak helped. Both these influences permitted stocks to be absorbed, and prevented, or rather checked, a glutting of the markets. If manufacturers and house, shop and railroad builders are going to take it for granted that our country is hungry and that the channels of trade are comparatively empty, they will not be very long in overcoming the good but somewhat accidental efforts produced by the causes named during the first six months. The impetus given by the abundance of capital is almost a permanent one. House building is going on actively. The June returns of the Real Estate Exchange of New York shows a larger business in buying of real estate and in new construction than during June of last year which had not been damaged by strike agitations. Plans were filed for 495 new buildings costing $6,732,755, against 320 for June last year, costing $5,151,425. For six months the transfer shows an excess of 1,500 in number and $41,000,000 in value. The outlay this year, in course, foots up $37,500,000, and the estimated outlay for the entire current year is $75,000,000 against $44,000,000 last year. Brooklyn shows a falling off from 2,030 projected buildings during the first half of last year, costing $10,567,417, to 1,878 enterprises this year, to cost, when completed, $9,267,417. The Philadelphia statistics for like periods are 1,796 against 1,964, showing a favorable increase this year over last. Throughout Pennsylvania, New Jersey and New York the extension of building operations is general. The demand for lumber, brick, stone, lath, cement, slate, roofing-material, to say nothing of house furnishings, is such as to lead the most doubtful to the conclusion that the building activity is deep and widespread. There is nothing in the labor field to note. Railroad strikes are over, and a District Court of the United States at Indianapolis proposes to lend its influence to put an end to them. With the Locomotive Brotherhood in the cab and the Knights on the track, and the United States Court in the background, we may expect some freedom and relief. The strike of a thousand or so mill men at Philadelphia has no special significance. The iron trade generally is quiet but a heavy demand is probable for all kinds of material. The coal producers are feeling a depression. The Vessel Owners' Association on the coastwise carrying trade are barely able to sustain rates. The lumber demand is heavy and continuous in all Eastern, Western, and Southern markets, and fair prices are realized. Yellow pine is growing in demand at certain points. White pine is active in New England markets along with spruce, but is dull at New York and Philadelphia. The hardwoods are not plenty and high prices rule for good stuff. Saw-mill interests are encouraged to extend plants, and planing-mill interests are growing along the lines of railroads contiguous to lumber fields. The makers of wood-working machinery are able to give more encouraging news at this time than a month or two ago. The fall outlook is said to be very good. The promise of abundant crops is not lost on the agricultural implement industry. The reports lately received from a few of the larger establishments in the Western States, warrant the conclusion that this prosperous branch of industry is to be favored with a further increase of orders. Files, small tools, small railway material, such as spikes, nails, nuts and bolts have been very lately largely inquired for by railroad builders and car and engine builders. It is easy to write good news at any time, but especially when no argument or guess work is necessary to assure ourselves that the news is reliable. From west of the Mississippi comes the announcements of the inauguration of extensive railroad building. So, also, from the extreme Northwest an impulse has been given to manufacturing and mining enterprises. New York capital has gone thither under attractive inducements. In fact, despite the Chinese-labor cry, the Pacific coast is a prosperous region and capital and enterprise are drifting in that direction rapidly. Prices in all branches of manufacturing are remarkably uniform. Locomotive work was never cheaper. Lumber prices have been lower, but a keen competition fails to depress them at present. Coal is lower than ever and new mines and regions are being opened to save long hauls. The railroad corporation in Pennsylvania and manufacturing corporations in Ohio, Indiana and Illinois are competing with each other for the coal traffic, with the effect of reducing coal to the consumer. Whatever future danger is involved in a revision of the tariff, the industries breath free again that they feel their escape. Steel rails at the proposed reduction could be imported. Textile products also could land more freely. Wool will probably continue safe under future attacks. The question is becoming more complicated by reason of the mixing up of political predilection and newly-developed interests of a personal nature. Much industrial capital finds safe and profitable employment in reproductive channels in the old hot-beds of free trade.